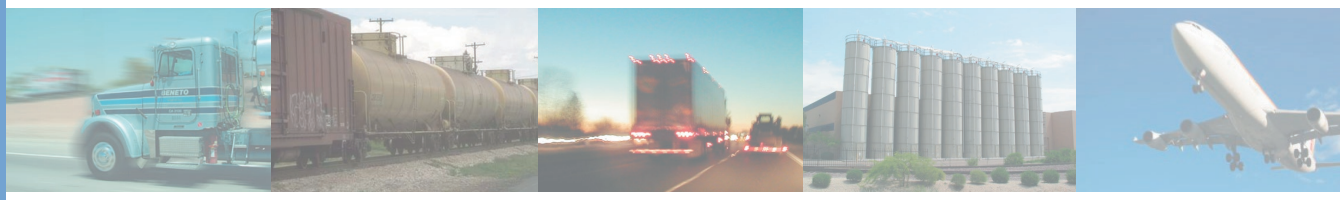
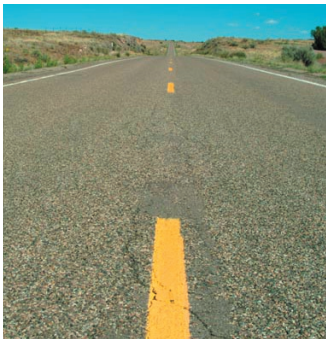


Regional Freight Assessment



April 2004

MARICOPA ASSOCIATION of GOVERNMENTS

Maricopa Association of Governments

MAG REGIONAL FREIGHT ASSESSMENT

APRIL 2004

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CHAPTER ONE

INTRODUCTION

The purpose of this study is to provide an overview of the goods movement process within the region, which comprises Maricopa County, and the member cities and towns of the Maricopa Association of Governments (MAG). This document represents a comprehensive inventory and analysis process that addresses various aspects of the freight transportation industry; provides an analysis of freight flows, total amount of transported tons, and the types of commodities which are moved; and also provides an overview of the modes of transport that are responsible for moving goods to, from, within and throughout the MAG Region. This study is designed to provide for a better understanding of general freight activities within the MAG Region, and is not intended to function as a plan, or as a formal policy document on which to implement future freight planning and investment decisions.

By providing a comprehensive assessment, or inventory and analysis of key freight information, it is anticipated that the following report will serve to establish an initial base for subsequent studies or freight-related planning. The goods movement process is an integral component of the region's overall economy and transportation network, and the freight element of the transportation planning process merits further action. This could entail a wide range of potential measures, such as forming a functional public-private committee to discuss freight issues; building stronger ties between the public and private freight sectors; the possible completion of a regional plan on freight; the development of formal regional policies which maintain an active role in the future direction of freight planning efforts; or simply initiating public discourse for the purposes of guiding and enhancing future freight endeavors at the local and regional levels.

The movement of goods and the ongoing activities of the freight transportation industry have many implications that impact the region's economy, the transportation system, and a number of other related urban issues. When considering the goods movement process, there are many societal interfaces that affect the economy, transportation, regional mobility, and the environment. The ability to transport goods for distribution and consumption is crucial to sustaining the regional economy of MAG. In an effort to maintain an efficient goods movement process, it is important to maintain adequate freight infrastructure and transportation facilities.

From a planning perspective, maintaining efficiency in the goods movement process depends on the ability of participants in the freight transportation industry to access and

utilize an adequate transportation network. This involves a number of additional key factors, which are related to the just-in-time transport of goods, regional safety, congestion issues, enhanced traffic flows and maintaining sufficient capacity on the regional transportation network. Although there are numerous issues and concerns associated with freight transportation, this study will assess various types of transportation freight-related concepts, provide general freight information, and provide a thorough review of existing conditions and commodity information.

DESCRIPTION OF THE STUDY AREA

The Study Area for purposes of this study will be inclusive of all lands and political jurisdictions located within Maricopa County, Arizona. The MAG Region includes the county government, 25 cities and towns, and 5 Native American Communities. As displayed on Map 1, MAG membership consists of the cities of Apache Junction, Avondale, Chandler, El Mirage, Glendale, Goodyear, Litchfield Park, Mesa, Peoria, Phoenix, Scottsdale, Surprise, Tempe, and Tolleson; the Towns of Buckeye, Carefree, Cave Creek, Fountain Hills, Gila Bend, Gilbert, Guadalupe, Paradise Valley, Queen Creek, Wickenburg and Youngtown; Maricopa County; and the Gila River, and Salt River Pima-Maricopa Indian Communities. The Arizona Department of Transportation (ADOT) and the Citizen's Transportation Oversight Committee also serve as ex-officio members for transportation-related issues. MAG is the designated Metropolitan Planning Organization (MPO) for transportation planning in the Maricopa County Region.

REGIONAL OVERVIEW

Maricopa County is geographically situated in the south-central interior region of the State of Arizona, and contains a total of 9,223 square miles of area. The county is ranked the 5th largest in total size out of 15 counties that are located within Arizona, and comprises approximately 8.1 percent of Arizona's total land area. Maricopa County is bordered to the north by Yavapai County, to the west by La Paz and Yuma Counties, to the south by Pima and Pinal Counties, and to the east by Gila and Pinal Counties.

According to year 2000 data compiled by the Maricopa Association of Governments, approximately 29 percent of all county lands were under private ownership; 28 percent of lands were under the direct ownership of the Bureau of Land Management; 14 percent of lands were under the jurisdiction of the U.S. Military; 11 percent was held within State trust; 11 percent of lands were under the direct ownership of the U.S Forest Service; 5 percent of land was comprised of Native American Communities, and the remaining 2 percent of lands in the county were classified as "other" public lands. When considering the type of land use within Maricopa County, approximately 58 percent of all lands were categorized as Agricultural/Vacant, 33 percent were open space, 5 percent were residential, and the remaining 4 percent of lands were classified as "other."

Table 1 displays the regional population base by jurisdiction and compares the overall changes in population between the years of 1990 and 2000. According to the U.S. Census Bureau, in 1990 Maricopa County contained a total population of 2,122,101 people, and had grown to 3,072,149 people by 2000.

The county's overall population density over the decade of the 1990s increased from approximately 230 people per square mile in 1990, to a total of 324 people per square mile in 2000. According to projected calculations, Maricopa County is expected to maintain a high-growth population scenario, and it is anticipated that the total population of the county will be over six million people by the year 2040, if not sooner.

With an increasing population base, there will be continued levels of demand on the Phoenix metropolitan area's transportation network, thus resulting in an increasing level of traffic congestion. When considering some of the forthcoming population issues associated with rapid growth, in addition to increasing levels of supply and demand in the marketplace, there will more than likely be an increase in the overall amount of goods that will have to be transported in order to sustain the regional economy of MAG.

OVERVIEW OF THE STUDY

This study addresses a variety of issues and subject matters directly pertaining to freight flows and the goods movement process, and also addresses a number of relevant freight activities and modes of transport. The remainder of the document consists of the following chapters:

Chapter Two: Overview of Freight

This chapter addresses a number of general concept items, which include freight planning; information on past freight planning efforts in the MAG Region; an overview of federal legislation and the regulation of freight; a description and overview of freight logistics; an overview of various modes of freight transport; a description and overview of the goods movement process; and a general overview of transportation networks and freight infrastructure.

Chapter Three: Regional Freight Infrastructure

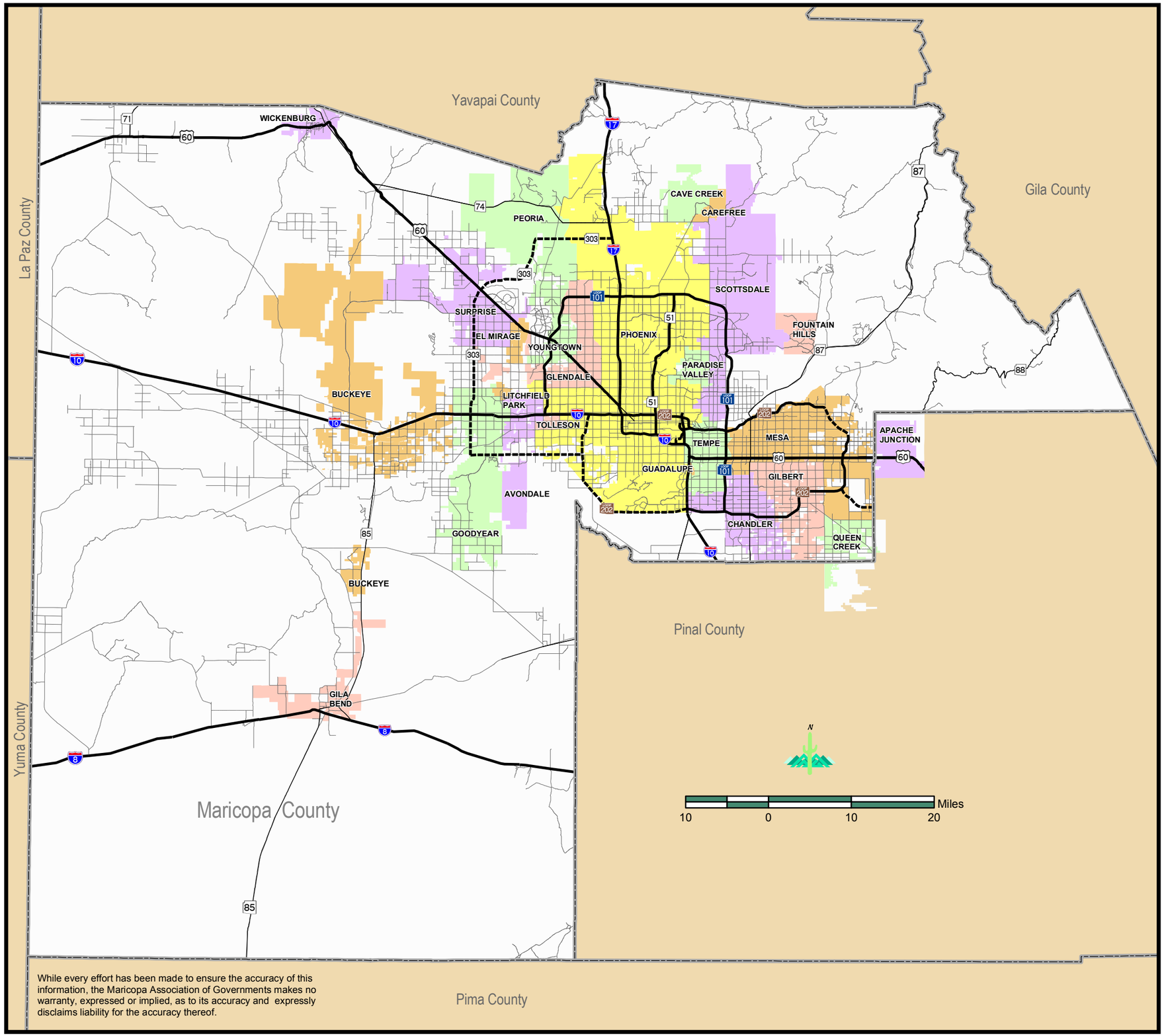
Chapter Three provides an overview of the MAG regional freight infrastructure. Items that are addressed in this chapter include the regional highway network; the regional arterial network; railroads; airports; pipelines; freight terminals; warehouses; intermodal facilities; and a brief overview of existing regional traffic congestion issues.

TABLE 1

MARICOPA COUNTY
POPULATION CHANGE 1990-2000

JURISDICTION	1990 POPULATION	2000 POPULATION	TOTAL % POPULATION CHANGE 1990-2000
City of Avondale	16,169	35,883	121.9
Town of Buckeye	5,038	6,537	29.8
Town of Carefree	1,666	2,927	75.7
Town of Cave Creek	2,925	3,728	27.5
City of Chandler	90,533	176,581	95.0
City of El Mirage	5,001	7,609	52.1
Town of Fountain Hills	10,030	20,235	101.7
Town of Gila Bend	1,747	1,980	13.3
Town of Gilbert	29,188	109,697	275.8
City of Glendale	148,134	218,812	47.7
City of Goodyear	6,258	18,911	202.2
Town of Guadalupe	5,458	5,228	-4.2
City of Litchfield Park	3,303	3,810	15.3
City of Mesa	288,091	396,375	37.6
Town of Paradise Valley	11,671	13,664	17.1
City of Peoria	50,618	108,364	114.1
City of Phoenix	983,403	1,321,045	34.3
Town of Queen Creek	2,667	4,316	61.8
City of Scottsdale	130,069	202,705	55.8
City of Surprise	7,122	30,848	333.1
City of Tempe	141,865	158,625	11.8
City of Tolleson	4,434	4,974	12.2
Town of Wickenburg	4,515	5,082	12.6
Town of Youngtown	2,542	3,010	18.4
Maricopa County (Unincorporated)	162,127	211,203	30.3
TOTAL	**2,122,101**	**3,072,149**	**44.8**

U.S. Census Bureau - * The City of Apache Junction, which became a MAG Member in 2002, had a Year 2000 population of 31,814.



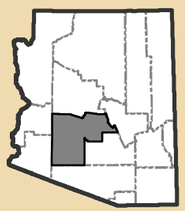
While every effort has been made to ensure the accuracy of this information, the Maricopa Association of Governments makes no warranty, expressed or implied, as to its accuracy and expressly disclaims liability for the accuracy thereof.

MAG Regional Freight Assessment

Map 1

THE MAG REGION

- Existing Freeway/Expressway
- Planned Freeway/Expressway
- U.S. and State Highway
- Highways
- Other Roads



Maricopa County, Arizona

MARICOPA ASSOCIATION of GOVERNMENTS

Chapter Four: Freight in the MAG Region

Chapter Four provides a comprehensive overview of freight within the region. It addresses a number of factors concerning the locations of where freight activities are concentrated, and also provides an analysis of commodity flow data and incoming (inbound) and outgoing (outbound) commodities. The chapter specifically addresses the following items: the MAG 2000 Employer Database; the concept of regional freight generators; land use and freight; community job centers; regionally traversed routes; trade corridors of significance; freight flows and commodity analysis.

Chapter Five: Trucking

This chapter provides an overview of the trucking industry, and addresses truck freight and facilities; major employers within the MAG Region that are actively engaged in the trucking industry; trucking and freight transport; commodity analysis; truck trade with Mexico; and a summary, which addresses a variety of common issues that are relevant to the trucking industry.

Chapter Six: Rail

Chapter Six provides information on the following items: an overview of the rail industry; an assessment of regional railroads and their associated yards and intermodal facilities; an overview of rail transport in the MAG Region; an analysis of rail commodities; and rail trade with Mexico.

Chapter Seven: Air Cargo

Chapter Seven provides a brief overview of the air cargo industry; assesses regional air cargo facilities; provides a brief overview of free trade zones; assesses air cargo transport in the region; and also provides an overview of air cargo commodities.

Chapter Eight: Summary

The final chapter of this study provides a brief overview concerning possible next steps in a comprehensive freight planning process for the MAG Region.

CHAPTER TWO

OVERVIEW OF FREIGHT

The movement of goods is a vital component to the general welfare and economic survival of any society. Without the means or ability to adequately transport goods for consumption and distribution, society would encounter ongoing difficulties in its ability to sustain itself, and to properly maintain a viable economy. The process of producing and distributing goods is essentially an economic activity. While transported goods, or "freight" has no considerable function in itself, the process of freight transportation increases the value of the products being transported by moving them to destinations where they are of greater worth.

In its simplest form, the purpose of the freight transportation industry is to engage in the movement of goods to, from, within and throughout a select geographic area or region. The movement of goods is conducted through the utilization of multiple modes of transport, such as air, pipeline, water, truck, rail, or other non-traditional means. Although that constitutes a broad concept, the reality of freight transport involves a complexity of networks and players who use a variety of methods, modes, available information technologies, and equipment to move raw materials, semi-processed and processed goods through regional, national and international markets for the purpose of commerce. The overall freight transportation arena involves both the public and private sectors, and although there are exceptions (such as the transporting of waste materials), goods movement is primarily concerned with market supply and demand.

In the United States, the freight industry is essentially dominated by the private sector, which literally involves thousands of companies and freight-related industries that are in business for the sole purpose of transporting and receiving goods. The freight transportation industry maintains its ability to function through the utilization of an active freight infrastructure, which is developed and provided through a variety of public and private interests. Freight infrastructure involves an array of transportation networks for mobility, as well as the physical structures and facilities necessary to receive, store, transfer and distribute goods. Collectively, all roads, railways, airports, pipelines, port facilities (in areas that are accessible by water), warehouses, freight terminals, and intermodal facilities comprise the overall components of what is commonly referred to as the transportation "freight infrastructure." All transportation networks and affiliated freight infrastructure is financed, constructed and maintained through efforts sponsored or undertaken by either the public sector, the private sector, or through the efforts of a joint public-private partnership.

The freight transportation industry includes trucking companies, railroads, air carriers, pipeline industries, maritime carriers and barge operations (where applicable), couriers, freight brokers, terminal operators, freight intermediaries, freight forwarders, package express carriers, and all other shippers and receivers of freight, as well as all freight industry customers. Government and traffic authorities also play a role, as well as the general populace, who are impacted by freight movements of some form when utilizing transportation networks. The industry involves the movement of millions of individual packages and commodities per day. Due to the mass movement of goods on a daily basis, and the complexity of the industry players involved, it is somewhat difficult to provide an extremely detailed overview of the freight industry, and to specifically monitor its daily operations, or the implications that freight may have on transportation networks and various sectors of the economy. However, there are several public and private agencies that are able to provide very useful information on commodity flow data for states and metropolitan regions. Such information identifies the general geographic movement of freight at the national, state and regional levels, and also provides general statistical information on the volume, tonnage and value of the goods being moved.

The availability of commodity flow data is able to provide an understanding and overview of patterns in the movements of goods. This information is extremely helpful to planners; public sector officials; industries; industry analysts; operations managers and operations industries; to governments and government agencies; and to decision makers that are responsible for analyzing operations and existing infrastructure conditions, and making key decisions for the future maintenance and development of transportation networks and infrastructure associated with the movement of freight. From a private perspective, commodity flow data assists with operations, obtaining additional industry data, and providing essential information on various markets; whereas, from a public perspective, this information assists communities and regions to obtain a better understanding of freight movements and various segments of the industries, which is crucial to understanding the importance of individual freight modes and developing policies for ongoing, coordinated freight planning.

While many transportation and freight professionals understand modes of transport, the vehicles and equipment used, and existing transportation infrastructure and facilities that are used for the movement of goods, the availability of current freight flow information establishes an essential base for the assessment and further planning of freight. In any arena, the understanding of freight and the ability to effectively plan for freight is essential to establishing policies for goods movement. However, the bottom line in any function or process designed to inventory, assess, plan, or to establish adoptable freight policies for local and regional planning is to maintain a high level of efficiency.

Enhancing operations, and maintaining sufficient infrastructure for ensuring the efficient flow of goods among and between various modes of freight transportation are the primary goals in most freight planning efforts. Theoretically, the efficient movement of freight enhances operations by ensuring on-time deliveries, saving transportation dollars, and also functions in a setting that reduces environmental impacts and traffic

congestion affiliated with inefficiency. Freight logistics, vehicle operations, freight infrastructure and transportation networks are all factors in the goal of achieving maximum efficiency in the freight transportation industry. The costs of inefficiency translate into high levels of congestion on the transportation network, environmental impacts affiliated with air quality, inefficient operations and terminal facilities, wasted fuel and resources, and higher operational costs affiliated with traffic.

In an effort to provide a general understanding and overview of the freight transportation industry, the following sections of this chapter will address freight planning; identify past efforts in the MAG Region that pertain to goods movement and comprehensive freight planning; review federal legislation and regulation of freight; address freight logistics; provide a general overview and review of freight modes in the United States; address the goods movement process of how freight moves from a shipper to a receiver; and will briefly address transportation networks and freight infrastructure. Subsequent chapters within the document will provide a detailed analysis of the regional freight infrastructure, assess freight in the MAG Region; and assess the trucking, rail, air cargo and pipeline freight modes and their relevance to the MAG Region.

FREIGHT PLANNING

Due to the inherent complexities of the freight transportation industry, the purpose of freight planning is multi-faceted by nature, and should pertain to the primary needs of any given political jurisdiction and its respective planning area. The purpose for planning in one region may not necessarily be the same reason to initiate or develop a plan for another region. Many public or private agencies or organizations, communities, or political entities possess a variety of different reasons, or issues for focusing on a specific planning process. Some efforts may be industry based, market driven, or government based, and may in fact wish to address operations, networks, infrastructure issues, or specific freight modes that are of importance to a specific location or defined region.

Although the purposes for freight planning and the byproducts of a comprehensive freight planning process may differ, all plans ultimately result in having similar types of objectives. Some of the reasons to initiate a freight planning process may include one or several of the following items: to assess a given subject, area, facility, condition or situation through a comprehensive inventory and analysis; to address issues and concerns; to assess, and develop a series of alternative scenarios or options for a select site, subject, condition, situation or freight mode; to design a series of goals and objectives, and/or policies to guide the planning process through measurable steps; or to develop a strategic implementation component to effectively carry out the motives and intent of the plan over a specified or non-specified period of time. From a community or regional perspective, freight planning efforts are essentially designed to assess issues and current conditions; understand base conditions pertaining to modes, infrastructure and commodity flows; and developing policies for continued planning, which are designed to maximize the efficient movement of freight throughout their

respective area.

Freight planning, or the implementation of a freight planning process, should be concerned with defining and understanding the concept of a freight transportation system. It is essential to understand the overall freight system of a select community or region by understanding the economic structure of the area in terms of existing business and industry, jobs, population, and regional freight generators. It is also very important to understand freight logistics, local or regional traffic flows and congestion, existing infrastructure, the regulatory environment, regional activity centers, and the key public and private sector freight entities involved in the shipping and receiving of goods throughout the region.

One of the primary objectives of any community or regionally-based freight planning process is to not only gain an understanding of current conditions, and to adequately plan for the future, but to also assess and identify potential operational and infrastructure inefficiencies in order to maximize the efficient movement of goods. This often results in the identification of a series of projects and capital improvements that will ultimately need to be funded through public, private, or public-private partnerships in order to enhance the freight transportation industry, and to ensure the efficient movement of goods.

Community and regional planning for purposes of land use, economic development, transportation, and a variety of other planning themes has been a mainstay in American society since the implementation of the U.S. Department of Commerce's Standard Enabling Acts of the 1920s. However, the concept and importance of planning for freight, or goods movement at a community or regional level has not been a common occurrence. Prior to the 1990s, the concept of coordinated freight planning was a rarity. In today's society, there is a specific need to plan for freight, and to identify potential infrastructure and operational projects that will benefit transportation freight infrastructure, as well as transportation networks. Throughout the United States, recent planning endeavors have made a concerted effort to link transportation freight needs and projects to potential revenue streams in order to identify when and how projects will be constructed and implemented over time.

Prior to 1991, there was very little coordination between comprehensive planning and the allocation of monies to enhance infrastructure for the movement of freight. The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 began to bridge the gap between planning and the coordination of allocated funding, by requiring State Departments of Transportation and Metropolitan Planning Organizations to consider freight and the impacts of freight movement upon commerce. ISTEA and the subsequent passage of the Transportation Equity Act for the 21st Century (TEA 21) in 1998 have resulted in higher visibility for freight planning.

In 1996, the *Freight Stakeholders National Network* conducted a survey of Metropolitan Planning Organizations (MPOs) located throughout the United States. The purpose of the survey was to obtain a better understanding of the level of MPOs involvement in

freight planning efforts since the implementation of the 1991 mandate of ISTEA, which clearly provided MPOs with the increased responsibility of enhancing freight planning efforts. The survey was sent to a total of 345 organizations, and had a response rate of 52 percent (178 responses).

Of the responses, the survey showed that over 90 percent of the nation's largest MPOs lacked sufficient staff and data to adequately conduct freight planning efforts. Other observations were as follows: 62 percent of respondents stated that their organization had no routine mechanism for collecting input from members of the freight community, and of those that replied by stating "no," only 23 percent had future plans for receiving future input; 74 percent of respondents stated that they had no established criteria for selecting freight projects, and of these, only 36 percent of the MPOs surveyed stated that they were in the process of actually planning any freight projects. Another key finding of the survey indicated that much of the basic transportation infrastructure located in America's largest metropolitan areas is severely strained, and that local transportation bottlenecks, inadequate infrastructure and urban congestion could have serious consequences on local economic development efforts.[1]

The 1996 Survey of MPOs is a clear indication that many metropolitan regions throughout the country are in the process of planning, designing or constructing freight infrastructure projects without adequately focusing on the issues or needs faced by many freight transportation providers and local shippers. It was concluded that many regions were not in a position to adequately plan for freight, and were more than likely attempting to plan or facilitate design or construction of projects without any coordination with, or input received from members of the freight industry. The results of the study concluded that the majority of the nation's transportation planners did not adequately understand many of the primary issues and problems encountered by the freight community.

The public sector's lack of knowledge and understanding of current needs is a common complaint of many freight professionals throughout the country. It is widely held that the link between government and the private sector could be bridged through the development of innovative partnerships, through the exchange of data and information sharing, and through initiating public freight planning efforts that specifically involves receiving and acting upon collective input from the private freight sector. There is a consensus among many of the nation's freight professionals that MPOs should have a better understanding of freight processes and operations. At a number of recent freight conference proceedings throughout the nation, the general consensus held by the majority of freight industry representatives is that the public sector, and MPOs in particular, need to develop adequate staff to understand and concentrate on freight processes and needs. The freight industry has also held that more infrastructure and operational projects must be identified in an effort to enhance freight efficiency, and that the public sector needs to maintain freight planning as a high visibility item in order to accommodate the freight planning process.

At a national level, when considering the Regional Transportation Plans of MPOs, many existing plans only address the subject of freight planning through a separate element, or through a separate component of their plans. Although many of these planning documents attempt to address freight, they are often not very comprehensive and have a tendency to be "broad based" in their efforts. Often, what is needed is an in-depth, comprehensive document that provides the following information: a base inventory and analysis of existing conditions within the respective study area; an understanding of annual freight flows; an understanding of existing intermodal freight facilities and their impact on the economy; a base assessment of each freight mode that is relevant to the study area; an intermodal assessment; an analysis of connectivity into the local and regional transportation network; the identification of policies; a comprehensive needs assessment that addresses all modal freight needs; proactive standards for implementation; a process that establishes an advisory/governmental board that is responsible for policy development and implementation; and the annual identification and ranking of priority freight projects for potential funding from local, regional, state and federal sources.

When considering the overall focus of transportation planning throughout the MAG Region, freight planning and "site-specific" planning for the efficient movement of goods at the regional level has received some attention through the Transportation Improvement Program (TIP) planning process. Many infrastructure needs pertaining to freight planning have taken place at the municipal level, and have typically been addressed on a case-by-case basis. Freight planning issues typically arise as the result of a crucial need for improved infrastructure, as the result of a new facility location, or through the need for a connector to newer or existing commercial and industrial developments. Many freight-related infrastructure and development projects throughout the region have consisted of federal, state and municipal funding, private funding, or in other cases, have been the result of public-private cooperative efforts. At times, these decisions are local, and there may be limited coordination between the primary community, adjacent communities, and the regional planning process.

While it is true that comprehensive freight planning has not been a primary area of focus for many areas throughout the country, recent federal legislation, and the increasing importance of transporting goods (and the relevancy of this sector on the economy), has brought about a need for effective planning and a comprehensive understanding of needs at all levels.

When assessing the growing importance of freight movements, in addition to the growing population base that will create further economic opportunities and the need for additional transportation infrastructure, there may be an increasing necessity to proactively address freight issues and related needs at a regional level. Such an effort could result in an ongoing, comprehensive plan that specifically addresses the area of freight planning; results in better cooperation and coordination between the public and private sectors; results in a thorough assessment of existing conditions; assesses short and long term needs; provides understandable policy measures, guidelines and recommendations; and initiates and guides an annual comprehensive planning process

that would ensure proactive planning, and efficient infrastructure and project development for freight planning needs at the local and regional levels.

PAST FREIGHT PLANNING EFFORTS WITHIN THE MAG REGION

Prior to 1995, with the exception of several private and site-specific efforts, coordinated and comprehensive planning for freight purposes did not exist within the public sector at either the regional or municipal levels. In the past, any references that pertained to "freight" were often found within municipal plans and site studies as design conceptualizations for intersections and right-of-ways; or identified in the form of individual policy statements, which were occasionally incorporated into the Transportation Elements of Municipal General Plans.

Regional efforts to adequately plan for freight issues and associated activities typically consisted of basic inventory work, occasional documentation of concerns from industry representatives, and broad-based policy statements, which were not comprehensive or specific to the concerns and needs of industry interests. Other planning efforts that addressed freight issues were often segmented in a variety of reports, and were never compiled into a "comprehensive" overview or plan for freight.

However, as mandated by ISTEA in 1991, MAG was required to implement a series of six "Transportation Management System" reports, which were intended to monitor the overall performance of the transportation system; identify needs; develop effective strategies; and address a variety of transportation problems. The management systems addressed regional congestion, pavement, safety, bridges, public transportation and intermodal facilities. In response to this federal requirement to assess intermodal facilities, MAG completed a comprehensive Intermodal Management System (IMS) report in 1995, which addressed a broad range of freight issues. The MAG Interrnodal Management System was completed in 1995, and addressed both passenger and freight intermodal facilities throughout the region.

Although MAG contained many past reports that referenced certain aspects of freight topics in studies pertaining to trucking, mobility, congestion, airport planning, and other related studies; the IMS represented the first "integrated" subject matter which specifically included a number of essential freight planning elements. The MAG IMS included goals, such as increasing opportunities for users to select from more than one mode, providing efficient transfers between modes, and involving both public and private sectors in the planning process. In connection with these goals, the IMS identified specific performance measures for freight related projects, which reflected freight transportation issues directly related to vertical clearance for trucks and trains; truck turning radii near freight terminals, distribution centers and warehouses; pavement access to intermodal facilities; travel times between intermodal terminals and the nearest interregional route; number of at-grade railroad crossings on arterials providing access to intermodal terminals; and the number of accidents involving trucks on arterials providing access to intermodal terminals.

Since the completion of the MAG IMS, there has been an increased awareness of the need to plan for freight at the regional level. On October 6, 1998, MAG, in cooperation with the Arizona Highway Users and the Arizona Motor Transport Association, conducted its first regional freight forum that was attended by members of the public and private sectors. The forum provided an important opportunity for members of the regional freight community to provide input on the expenditure of transportation funds for the benefit of potentially enhancing the regional freight system. Since this first gathering of the regional freight community, MAG has maintained an ongoing awareness of regional freight activities and needs. During 1999 and 2000, MAG conducted an external travel survey and analyzed the results, which included studying the pattern of truck travel into and through the region. Also, in September of 2001, MAG hosted the Western States Intermodal Planning Group's Annual Conference, which included a focused session on how to specifically address future freight challenges in the region.

Recently, MAG has worked in cooperation with the public and private sectors to consider regional freight policies in their new 20-year regional transportation planning process, and has been working toward the formal completion of a comprehensive inventory and analysis of regional freight, which could ultimately lead to the creation of a plan that coordinates each one of the relevant freight modes.

FEDERAL LEGISLATION AND REGULATION OF FREIGHT

At the Federal level, a number of approved Acts and legislation over the decade of the 1990s have helped shape various aspects of the freight transportation industry. One of the primary pieces of passed legislation that enhanced freight transportation within the United States was the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). In accordance with specific language from the Act, ISTEA called for the development of a National Intermodal Transportation System that was economically efficient and environmentally sound, which provided for the U.S. to compete in the global economy by moving people and goods in an efficient manner.

Although very comprehensive, the basic premises of ISTEA from a freight perspective emphasized intermodal efficiency, and the importance of transportation and freight movements to economic development activities, which are crucial in enhancing the country's competitiveness within the international marketplace. ISTEA acknowledged the importance of the freight transportation industry, and called for increased planning requirements by individual state governments and MPOs throughout the country. Also, ISTEA required environmental and social factors to be considered in transportation planning, programming and project selection. It stipulated that all transportation projects (including intermodal and freight enhancement projects) were to be consistent in attaining federal clean air standards as specified within the Clean Air Act of 1990. ISTEA called for cleaner fuels and vehicle emission standards as specified in the Clean Air Act, and also embraced the concept of alternative fuels, as specified within the National Energy Policy Act of 1992. Among many components, ISTEA also called for

more social considerations and public input, and required the implementation of six management systems throughout states and major urban areas, which addressed key freight issues such as congestion and intermodal facilities planning.

The Transportation Equity Act for the 21st Century (TEA-21) was enacted in 1998, and essentially extends the concepts and ideas of ISTEA by emphasizing a continued need for active involvement and planning by states and MPOs. TEA-21 provides for multimodal and intermodal transportation policy, planning, and program activities that enhance the integration and connectivity of the transportation system for people and freight.

The enactment of ISTEA and TEA-21 has led to an enhanced awareness of freight, and addresses specific provisions that provide for the active inclusion of freight planning efforts throughout each state and MPO. Aside from this current legislation, throughout the 20th Century, there were a number of past federal requirements and regulations that effectively provided oversight for a number of activities associated with individual modes of transport. Some of these Acts and regulations, as well as their significance, will be covered in further detail in the following chapters pertaining to individual freight modes in the MAG Region.

When considering regulatory aspects of the freight transportation industry, and the process of moving goods from one location to another, there are a number of agencies that monitor and oversee various domestic and international operations. Table 2 displays a list of Federal regulatory agencies that are responsible for monitoring various activities associated with freight. This information displays the responsible regulatory agency by individual freight mode.

In an effort to provide a broad overview of national freight, the following sections of this chapter will allude to barge and maritime activities associated with the water freight transportation mode. However, due to the insignificance of water transport in the MAG Region, Table 2 excludes goods that are shipped via water, and instead provides focused regulatory information for air cargo, rail, trucking and pipeline activities.

FREIGHT LOGISTICS

As defined in the previous section, freight, or goods movement, is primarily concerned with the movement of goods to, from, within and throughout a select geographic area or region. The movement of goods is conducted through the utilization of multiple modes of transport, such as air, pipeline, water, truck, rail, or other non-traditional means. In the MAG Region, there are four identifiable freight modes that constitute the primary means for the shipment and receipt of all freight materials. These include trucking, rail, air cargo, and pipelines.

The movement of goods not only requires a reliable transportation network and selected modes of transport, but also relies on efficient operations, and requires a very efficient

TABLE 2

FEDERAL REGULATORY AGENCIES RESPONSIBLE FOR DOMESTIC AND INTERNATIONAL FREIGHT

FREIGHT MODE	DOMESTIC	INTERNATIONAL
Air Cargo	• Federal Aviation Administration • Environmental Protection Agency	• Federal Aviation Administration • International Air Transport Association • International Civil Aviation Organization • U.S. Customs Service • U.S. Immigration and Naturalization (For Imported Goods)
Trucking	• Federal Highway Administration • Environmental Protection Agency • Occupational Safety and Health Administration • Surface Transportation Board • State and Local Safety and Tax Officials	• U.S. Customs Service • U.S. Immigration and Naturalization (For Imported Goods) • Requirements of Foreign Country where truck is being operated
Rail	• Federal Railroad Administration • Environmental Protection Agency • Surface Transportation Board	• U.S. Customs Service • U. S. Immigration and Naturalization (For Imported Goods) • Requirements of Foreign Country where Train is Being Operated
Pipeline	• U.S. Department of Transportation (Office of Pipeline Safety) • Federal Energy Regulatory Commission	• Not Applicable

Source: U.S. Department of Transportation, U.S. Freight: Economy in Motion 1998

system of "logistics." The primary concept of freight logistics is centered on a general theme, or "premise" of enhancing the overall efficiency of transporting freight from one location to another. Logistics attempt to source, manufacture and deliver a commodity, or multiple commodities in the most efficient manner. Although there are many ways to define this process, a broader definition states that freight logistics involve "the process of planning, implementing and controlling the efficient, cost-effective flow and storage of raw materials, in-process inventory and finished goods, and related information from point of origin to point of consumption for the purpose of providing cost-effective customer service."[2]

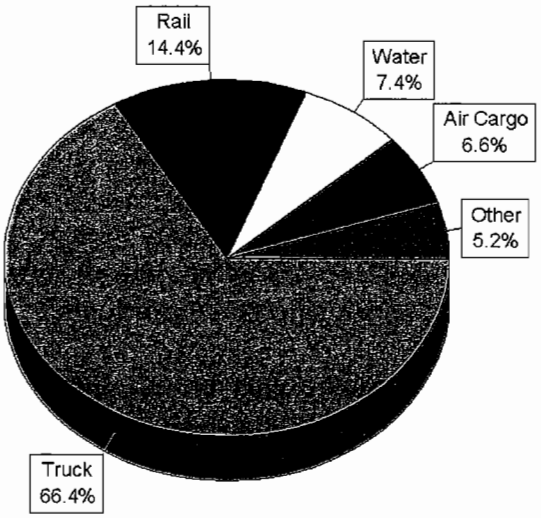
Logistics are concerned with maintaining efficient freight operations by transporting goods over adequate transportation networks; choosing the most sensible, timely and cost-efficient modes of transport; and utilizing the most up-to-date, available information technologies. However, freight logistics differ from freight operations, and the difference between the terms should not be confused. While it is true that freight operations involve the process of moving goods from a shipper to a receiver, freight operations are essentially a subset of activities associated with the term "logistics." Freight logistics involve the utilization of available transportation networks and services, operations, and information technologies, which collectively are designed to maximize efficiency in the transportation of goods from origin to destination.

The process of transporting commodities, or goods, is essentially an economic activity, brought about by market supply and demand. Advanced logistics and "just in time" production practices associated with the transportation of goods came into acceptance during the early-1980s, through increases in newer forms of available technologies. Such technologies involve advanced communications, and an eventual shift toward the Internet and web-based carrier exchanges. Increases in technology have allowed the process of logistics to advance over the years, and has allowed many companies to change their outlook on production processes, and the way inventories are maintained. From an economic development perspective, over the past 10 years businesses within the national and international markets have rapidly changed as many companies have shifted from inventory-based "manufacture to supply" logistics ("Push" logistics) to replenishment-based "manufacture-to-order" logistics ("Pull" logistics). Before the widespread availability of information technologies, many companies had a tendency to maintain expensive inventories in order to effectively meet demand for certain products. Today, "manufacture-to-order," or "pull logistics" relies less on having to maintain expensive inventories, and focuses more on obtaining accurate information and providing timely transportation to match market supply and demand.[3]

MODES OF TRANSPORT

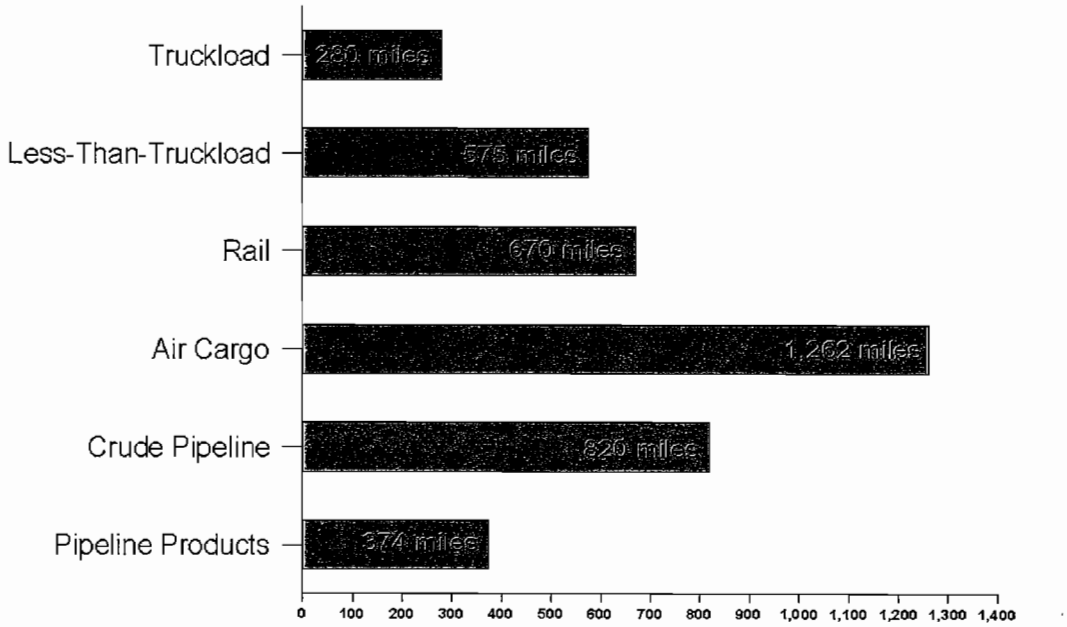
Freight logistics have provided for a higher degree of efficiency in the freight transportation industry, and in the ways that goods are transported in the global, national, regional and local marketplaces. However, when considering logistics, an important decision that is crucial to the efficient movement of goods is determined by the mode of freight utilized to move a shipment. As stated, the primary methods of transporting commodities in the marketplace at the national level involve rail, air cargo, truck, pipelines, and where applicable, water transportation. However, due to the fact that the MAG Region does not contain navigable waterways capable of moving waterborne freight, the topic of water freight will not be covered in any length, with the exception of a few references to its relevance in the overall freight component of the national economy.

FIGURE 1
1998 - U.S. FREIGHT SHIPMENTS BY MODE



Source: U.S. Department of Transportation, FWHA, *Freight Analysis Framework*, 2002

FIGURE 2
AVERAGE DISTANCE TRAVELED BY FREIGHT MODE



Source: U.S. Department of Transportation, FWHA, 1998

According to the U.S. Department of Transportation, Federal Highway Administration, there were a total of 15 billion tons of freight moved in the United States during 1998, which had a total estimated value of approximately 9 Trillion dollars. Based on these findings, it was calculated that there was a total average of approximately 310 pounds of freight which was shipped to each resident of the United States on a daily basis. As displayed in Figure 1, the total percentage of overall freight shipments by mode in the United States during 1998 is as follows: Truck (66.4 percent); Rail (14.4 percent); Water (7.4 percent); Air Cargo (6.6 Percent); and Other (5.2 percent). The "Other" category includes tabulated data from international shipments, pipelines and other facilities. The movement of "bulk goods" over the national freight system constituted the largest percentile share of shipments in terms of overall tonnage. These particular goods included items such as ores, coal, and grain products.[4]

Although this information provides a very broad overview of freight at the national level, the freight transportation industry is extremely segmented, and there are many reasons why one mode of transport may be selected over another. For example, such reasons may include factors pertaining to operations; issues related to overall cost-effectiveness; the types or number of markets being served; the particular types of goods being moved; industry arrangements; technology factors; the types of equipment available; labor issues; distance factors; economies of scale; and a variety of additional items that need to be considered.

Typically, the type of mode utilized to ship goods is determined by the distance that must be traveled, and the overall weight of a particular cargo. Figure 2 provides an overview of the average length of haul by distance traveled. The figure displays information by truckload, less-than-truckload, rail, air cargo and pipeline products. Generally, domestic commodities (with the exception water transport) that are generated within the United States and contain heavier loads (in terms of overall tonnage) have a tendency to be shipped in bulk, and often rely on rail as a viable form of transport. Also, for commodities that are traveling over 700 miles, rail tends to be more of a cost effective option for larger cargos. Shipments that are time-sensitive, or that are generally less expensive to transport because of lower volume or weight, are often shipped as air freight.

Trucking, rail, air cargo and pipeline freight modes all have varying characteristics associated with the types of goods that are moved, and the overall distances that they are moved. According to a 1998 report from the U.S. Department of Transportation, Federal Highway Administration, trucking is the most dominant form of freight transport. For this form of transport, in 1998 cargos in trucks containing full truckloads traveled a total average distance of approximately 280 miles; whereas cargos in trucks containing less-than-truckload cargos traveled a total average of 575 miles. A typical load that was transported by truck was considered to be of moderate to high value, and contained loads of less than 50,000 pounds. Approximately two-thirds of all commodities shipped by truck moved less than 100 miles, and on average, interstate carriers averaged distances of more than 400 miles. Cargos that were moved by rail were hauled an average distance of approximately 670 miles. Rail shipments consist of goods that are

considered to be of low to moderate value and typically contain full carloads, with no weight restrictions. Commodities that were transported by air were hauled an average of 1,262 miles by plane. As mentioned in the paragraph above, air transport generally involves high value goods, or goods and small packages that have critical delivery times and require relatively quick delivery to the receiver. Goods that are shipped by air typically consist of packages that are less than 100 pounds in weight. In addition, products that are moved by pipeline typically consist of liquids and gas substances, and are typically low in value. According to the national average, commodities that were transported by pipelines traveled a distance of approximately 374 miles.[5]

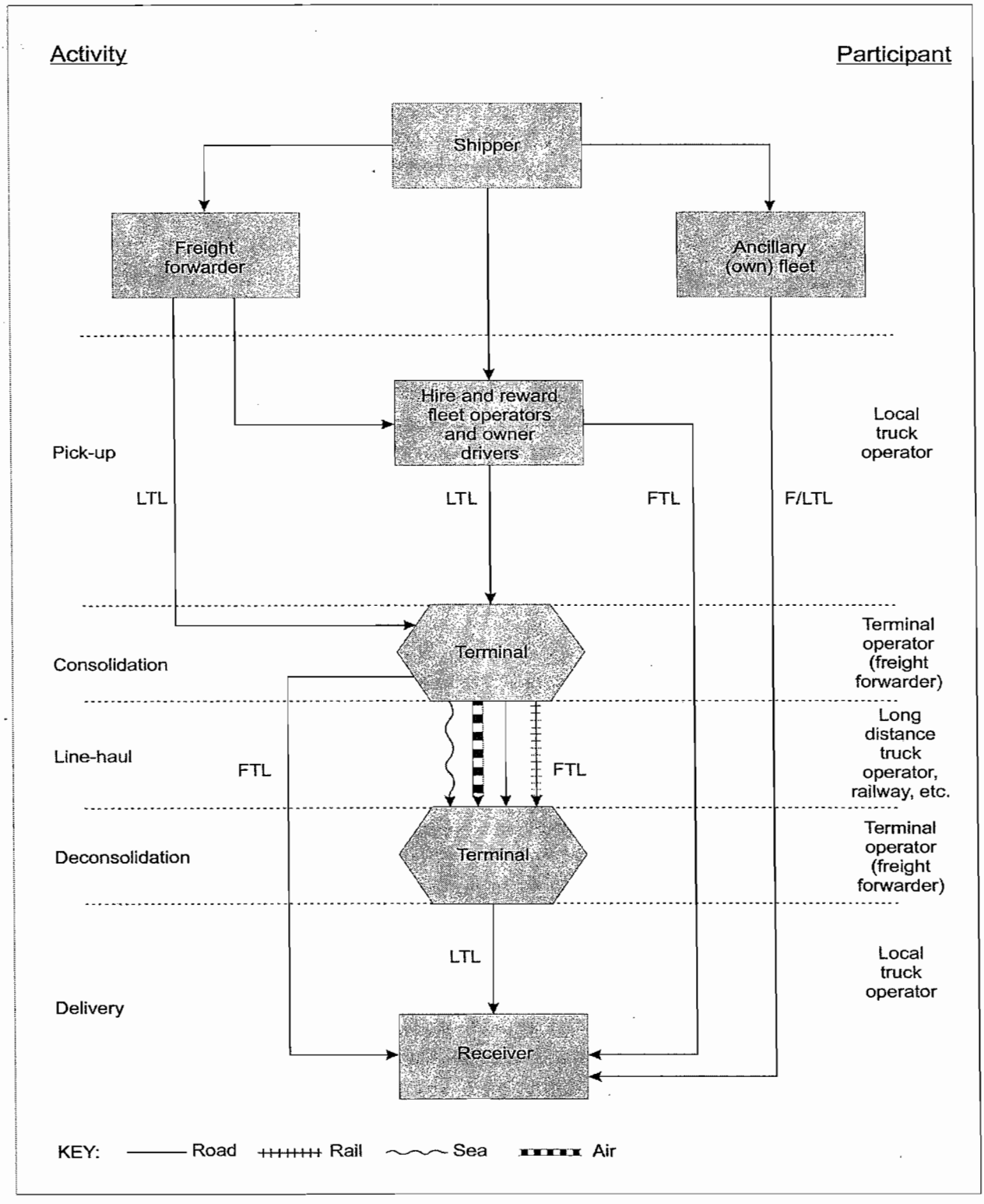
THE GOODS MOVEMENT PROCESS

The process of shipping freight from a point of origin to a point of destination may include a direct transfer, or a series of operations involving a number of different carriers and facilities in a variety of geographic locations. The overall freight transportation process as it exists today in the United States is at times very complex, often involving a variety of shippers; forwarders; terminal and warehouse operations; modal transfers at intermodal facilities; multi-faceted industry operations and applied information technologies; and companies specializing in specific market segments and various modes of transportation, whether it is by truck, water, rail, air, or in other cases, pipelines. Although this process can be seemingly complex in some cases, the process itself always relates back to the simple economic principles of market supply and demand, and the concept of moving a commodity or commodities from a point of origin to destination.

Figure 3 displays the goods movement process at its base level. The figure represents a number of possibilities that can take place with a consignment, or shipment, while in the process of being transported from a shipper to a receiver. Typically, as displayed in this type of scenario, a shipper has three options that are available when transporting a good. These options include one of the following: to arrange services with a professional freight forwarder; to hire a commercial trucking firm to ship the freight; or for the company, or primary "shipper," to deliver the products directly to the receiver through the utilization of its own truck, or fleet of trucks.

A freight forwarder is basically a company, or broker, whose primary purpose involves the consolidation of freight loads from multiple shippers in an effort to take advantage of economies of scale. Such firms may own and operate their own fleet of trucks. However, in cases where they do not own their own trucks or modes of transport, they basically serve as brokers, which specifically arrange services to ensure that the shipment is taken to its point of destination. In cases where a private trucking company is hired to deliver freight, there are a variety of options available to transport goods to a place of destination. For example, if a shipment involves a full truckload (FTL), it may very often be shipped directly to the receiver. In cases where shipments are made on a less-than-truckload (LTL) basis, the trucks, or modes of transport, are often sent directly to the trucking company's terminal, where their load is combined with other shipments

FIGURE 3
THE GOODS MOVEMENT PROCESS



Source: K. W. Ogden, *Urban Goods Movement: A Guide to Policy and Planning, 1992*

and eventually sent to the receiver. In cases where the shipper maintains its own trucks, it will often arrange direct delivery of the freight to the receiver. [6]

In either case, the flow of freight in this scenario as depicted in Figure 3 is directed along a number of several lines. If the shipper maintains its own transport services, then the delivery is often directly to the receiver. However, in the case where the shipment is arranged by a freight forwarder, the shipment could either go directly to a hired trucking company of the forwarder, which in turn could deliver the shipment directly to the receiver; or deliver the shipment to a terminal (or warehouse), where it is consolidated with other freight. In the case of consolidation, it may then in turn go directly to the receiver, or go to another warehouse or terminal where it is deconsolidated and placed on another truck to its place of delivery. In cases where the freight forwarder owns its own trucks, the shipment could either go directly to the receiver, or go through a warehouse/terminal process, where it is consolidated (and possibly again deconsolidated) prior to reaching its final destination. In the case where a private trucking company is hired, the goods movement process is similar, whereby a company could either send the shipment directly to the receiver, or through a consolidation and a possible deconsolidation process before the freight is delivered to the receiver.

For intra-urban and intra-regional goods movement where loads are consolidated, there is generally a single terminal operation (pick up of shipment – to terminal – to delivery). However, in cases where shipments are made to other regions or areas, through what is known as a "line haul," there is often a second terminal function at the destination (pick up of origin terminal - to destination terminal - to delivery). Line hauls could be made through a number of available transportation modes, such as trucking, rail, sea, or air cargo.[7]

Although the above description of Figure 3 represents a generic shipper-receiver model of commodity flows, in the broader process of freight transportation movements, there are several deviations. While the concept is accurate, the involved parties, as well as several of the processes for delivery, may differ somewhat. Shipments could take on varying delivery patterns, or involve other modes of transport. For example, a raw material could be taken from its point of origin via rail or ship to a processing plant, which in turn manufactures the materials and distributes them accordingly. Or some products in a manufacturing process could be shipped directly from one plant to another, prior to the completion and distribution of a good. Also, in some cases a company may pick up goods from a particular location or market, and bring them back for sale or distribution. Nonetheless, this model provides a general understanding and description of how the goods movement process operates within a given marketplace.

What is evident in the national freight transportation industry is that the movement of freight can be a very simple process involving the direct delivery of a shipment in a day (whether local or regional), or may in fact take several days to weeks for delivery, which in many cases leads to a higher level of sophistication and complexity. While it is the intent of this chapter to provide a brief, general overview of freight, the following

sections of this document will address modes of transport that are specific to the MAG Region in more detail. The freight modes that will be addressed in subsequent chapters of this document will include trucking, rail, and air cargo.

TRANSPORTATION NETWORKS AND FREIGHT INFRASTRUCTURE

At a national level, in 1998 approximately 15 billion tons of freight were shipped over a national transportation system that consisted of over 4 million miles of roadway, over 19,000 airports, over 100,000 miles of rail, and a liquid pipeline and natural gas network that consisted of approximately 1.4 million lineal miles. In addition, there were over 5,000 functional inland waterway cargo facilities on the nation's coasts, rivers and the Great Lakes.[8] To ensure the economic vitality of the nation, it is crucial to maintain and update an efficient transportation network, and to maintain and develop an efficient freight infrastructure for the movement of goods at the international, national, regional and local levels. In an effort to maintain any degree of competitiveness in the global economy, and international marketplaces, the nation requires the ability to develop and enhance an integrated transportation network that guarantees the efficient and cost-effective methods for distributing and receiving commodities.

When considering the importance of integrated transportation networks and the necessary infrastructure to accommodate the movement of freight, an important element of a comprehensive, transportation planning process involves the ongoing analysis and review of the freight process over time. This involves an understanding of current transportation networks that accommodate various modes of transport; the efficiency and maintenance issues affiliated with those networks; their connectivity and reliability for the movement of freight; an understanding of their ability to ensure efficient movement and mobility; the assessment of existing freight infrastructure; transportation patterns and an understanding of freight-generating activities; an understanding of freight needs, information technologies and logistics; and an ongoing assessment of these particular items, in an effort to ensure an effective goods movement process.

The subsequent chapters of this document will provide an overview of regional transportation networks and the existing freight infrastructure by which goods are moved. It will also assess base information in an effort to determine the location of freight generators, determine the relationship between transportation networks and infrastructure to freight, and provide a comprehensive overview and analysis of commodity flows and data which is relevant to freight and commodity movements within the MAG Region

Chapter Footnotes

1. Freight Stakeholders National Network, *Improving Freight Mobility: Survey of Metropolitan Planning Organizations*, March 1996.

2. Ogden, K.W., *Urban Goods Movement: A Guide to Policy and Planning*, Page 49, 1992.

3. U.S. Department of Transportation, Federal Highway Administration, *The Freight Story: A National Perspective on Enhancing Freight Transportation*, Pages 7-8, November 2002.

4. U.S. Department of Transportation, Federal Highway Administration, *The Freight Story: A National Perspective on Enhancing Freight Transportation*, Pages 2-3, November 2002.

5. U.S. Department of Transportation, Federal Highway Administration, *U.S. Freight: Economy in Motion 1998*, Pages 12-35, May 1998.

6. Ogden, K.W., *Urban Goods Movement: A Guide to Policy and Planning*, Pages 45-48, 1992.

7. Ogden, K.W., *Urban Goods Movement: A Guide to Policy and Planning*, Page 46, 1992.

8. U.S. Department of Transportation, Federal Highway Administration, *The Freight Story: A National Perspective on Enhancing Freight Transportation*, Page 3, November 2002.

CHAPTER THREE

REGIONAL FREIGHT INFRASTRUCTURE

The purpose of this chapter is to identify the infrastructure of the regional freight system, and to address the essential elements of the system that are utilized to handle, store and move goods throughout the region. The regional infrastructure over which goods are moved involves an extremely complex network of transportation routes and facilities, and also includes the necessary facilities to accommodate the handling, storage, and the transferring of freight as it moves through the distribution process.

Within the MAG Region, the overall freight system's infrastructure includes the regional highway network, the regional arterial network, railroads, airports, pipelines, freight terminals, warehouses, and intermodal facilities. This chapter is intended to provide a general overview of the existing infrastructure throughout the MAG Region; whereas the subsequent chapters of this document will provide further detail with regard to various aspects of transportation networks, and the facilities that play an essential role in the movement of goods.

REGIONAL HIGHWAY NETWORK

As Displayed on Map 2, the MAG Region consisted of approximately 312 miles of existing freeways and expressways in 2002. The major routes traversing the region consist of Interstate Highways 8, 10, and 17; State Routes 51 and 143; U.S. 60 and Loops 101 and 202. Interstate Highway 8 is located in the southern section of the MAG Region, and consists of a 68-mile stretch of freeway between Pinal and Yuma Counties. Interstate Highway 10 consists of a 98-mile segment of roadway from Pinal County in the south, to La Paz County in the west. It is referred to as the Maricopa Freeway in central Phoenix, and as the Papago Freeway on the western side of the Phoenix Metropolitan area. Interstate Highway 17, also referred to as the Black Canyon Freeway, originates in the City of Phoenix and contains a 48-mile segment that extends north to Yavapai County.

As displayed on Map 2, the other major freeways and expressways in the region include U.S. 60 (Superstition Freeway), which consists of a 23-mile segment from the junction of I-10 to the Pinal County line; State Route 51 (Piestewa Parkway), which consists of an 18 mile segment from the junction of I-10 to north Phoenix, where it connects to Loop 101; the Loop 101, which forms a circumferential 60-mile route around the

northern part of the Phoenix Metropolitan area (containing the Price Freeway in the south, the Pima Freeway to the east, and the Agua Fria Freeway to the west); and the existing Loop 202 (Red Mountain Freeway), which currently consists of a 20-mile segment from the junction of I-10 to the East Valley of the metropolitan area. State Route 143 (Hohokam Expressway) provides a 3.1-mile segment which links I-10 and Loop 202.

Loop 202, which is scheduled for completion in 2007, will contain a completed total of 57 miles of freeway around the eastern region of the metropolitan area. This will include the completion of the Red Mountain Freeway to the north, and the Santan Freeway to the south. Map 2 also displays a future extension of Loop 202 (referred to as the South Mountain Parkway), which consists of a proposed 22-mile segment that links the southern part of I-10 to the western part of I-10 (Papago Freeway).

Another regional segment of significance that has been proposed for the MAG Region is the Loop 303. This segment will connect I-10 to I-17 in the western part of the metropolitan region, and will consist of approximately 40 miles of roadway. Collectively, as displayed on the map, there will be over 400 miles of functional freeways and expressways throughout the region when all of the proposed segments are constructed. State Route 51 will be completed by late-2003, and the Loop 202 in the East Valley will be completed by 2007. The Loop 202 connector for I-10, and the Loop 303 to the west are subject to voter approval of the extension of a half-cent sales tax, which will be proposed to residents of Maricopa County in 2004. Once completed, this network will continue to serve as a viable component for the overall movement of freight by adding needed capacity, and contributing to congestion relief.

In addition to the existing and planned freeways and expressways, U.S. 60 and several additional State Highways also allow for local, regional and intra-regional connectivity for the efficient movement of goods. As displayed on Map 2, U.S. 60 extends from the Superstition Freeway, located in the eastern MAG Region, to the northwestern section of the region through the Town of Wickenburg, and on to La Paz County. Also, State Highway 74 extends from I-17 to U.S. 60 in the northern part of the MAG Region. Aside from these segments, State Route 87 is located in the eastern part of the region, and extends from Pinal county in the south, to Gila County in the north, where it provides access to northern sections of the State, and connectivity to I-40. State Highway 85 is located in the western section of the MAG Region, and allows for a convenient truck connector between I-8 and I-10.

In November of 2003 MAG adopted a Regional Transportation Plan, which establishes a 20-year planning horizon for freeways, streets, transit, and other transportation modes and programs within Maricopa County. As part of the planning process, MAG identified future and proposed freeways and expressways throughout the region. As displayed on Map 2, additional freeways that are proposed for future construction include the Williams Gateway Freeway in the southeastern area of the region (including northern Pinal County), and the Interstate 10 Reliever, which is proposed for construction between Loop 202 and Loop 303 on the west side of the region.

MAG Regional Freight Assessment

Map 2

REGIONAL TRANSPORTATION NETWORK

- Existing Freeway/Expressway
- Planned Freeway/Expressway
- U.S. and State Highway
- Other Roads
- Railroad
- Airports

MAP AREA

MARICOPA

MARICOPA ASSOCIATION of GOVERNMENTS

While every effort has been made to ensure the accuracy of this information, the Maricopa Association of Governments makes no warranty, expressed or implied, as to its accuracy and expressly disclaims liability for the accuracy thereof.

Miles
0 5 10 15

REGIONAL ARTERIAL NETWORK

The MAG arterial network consists of paved roadways usually of four or more lanes, and is generally arranged on a regional one-mile grid system. This network functions as the primary base for transporting people and goods throughout the region, and consists of approximately 8,500 miles of arterial streets. The current network allows for the orderly movement of goods throughout the region, and also provides for a high level of connectivity into county, regional and national transportation networks. Based upon MAG projections, it is anticipated that the existing system will continue to expand by a combination of new roadway construction through the paving of existing dirt roads, and through the widening of existing arterial streets. Map 2 displays the existing arterial network, and also displays the names of primary roadways that comprise the overall system throughout the MAG Region.

In addition, the non-arterial street system, which also provides key routes for the movement of goods, includes all of the remaining local and collector streets throughout the metropolitan area. Collectively, local and collector streets comprise approximately 75 percent of all street mileage throughout the MAG Region. However, the majority of all traffic is either moved by the arterial street network, or through the regional highway network.

RAILROADS

The Union Pacific Railroad (UP) and the Burlington Northern Santa Fe (BNSF) Railway are the only companies that currently maintain existing tracks throughout the MAG Region. As displayed on Map 2, the UP maintains a freight rail line that enters the metropolitan region through the Southeast Valley near Riggs Road, and travels through the communities of Queen Creek, Mesa, Tempe, Phoenix, Tolleson, Avondale, Goodyear, and Buckeye. In 1995, approximately 90 miles of UP track to the west of the MAG Region, in between the Town of Buckeye, and the Town of Wellton, located in Yuma County, was abandoned and is no longer in use for the purpose of transporting goods.

In addition to this main line that runs through the metropolitan area, the UP also maintains line extensions into the City of Chandler and the Town of Gilbert, which serve a number of industrial clients. Although not displayed on Map 2, the UP maintains its primary line in the southern part of the MAG Region, which travels east and west through the Town of Gila Bend. Although the southern line is a freight rail, it also provides passenger services to the public, and is part of Amtrak.

BNSF currently operates several rails throughout the MAG Region. The primary line within the region extends from central Phoenix, and through the communities of Glendale, Peoria, El Mirage, Surprise and Wickenburg. The line extends to the far northwestern section of Maricopa County, and then extends to northern Arizona in the City of Flagstaff, where it connects to the BNSF main track, providing continental

service to a variety of areas throughout the country. In addition to the main line in Phoenix, BNSF also maintains rail in south Phoenix, which provides service to a number of industrial clients. BNSF also maintains tracks on the western side of the metropolitan region, located adjacent to the existing Cotton Lane road alignment.

AIRPORTS

As displayed on Map 2, there are presently 12 airports located throughout the metropolitan area of the MAG Region, which have been identified within the MAG Regional Aviation System Plan. A total of 4 other civilian airports examined in the plan are located outside of the metropolitan area. Table 3 provides an overview for each of these airports, and includes information on the size of each facility; the number of runways; the length of the longest runway; the total number of aircraft based at each airport; the total number of annual operations (takeoffs and landings); and the primary classification of each airport. As identified by Table 3, the airports within the region have been categorized into one of three classifications, which are based on the Federal Aviation Administration's (FAA) NPIAS (National Plan of Integrated Airport Systems) airport classification system. This classification system is widely recognized and accepted throughout the United States, and is essentially utilized by the FAA to define an airport's status by its primary service level. These classifications as identified in Table 3 include Commercial Service, General Aviation and Reliever Airports.

According to the MAG Regional Aviation System Plan, Phoenix Sky Harbor International serves as the region's commercial airport, and is presently the fifth busiest passenger airport in the world. It is classified as a large hub Commercial Service airport, which means that it boards more than 1 percent of all passengers throughout the nation on an annual basis. Aside from providing passenger service, Phoenix Sky Harbor International also maintains a considerable cargo function. In addition, Williams Gateway Airport in Mesa also maintains a significant cargo presence in the region.

There are also a total of 7 Reliever Airports and 4 General Aviation airports located within the MAG Region. By definition, a reliever airport is essentially a general aviation airport established to relieve congestion at a busy commercial service airport by providing an alternative landing place for small aircraft. The primary reliever airports in the region include Chandler Municipal, Glendale Municipal, Mesa Falcon Field, Mesa Williams Gateway, Phoenix-Deer Valley, Phoenix-Goodyear Municipal, and Scottsdale Municipal.

A General Aviation airport is an airport that does not handle commercial service or military aircraft. Its facilities cater extensively to recreational and pilot training activities, such as flight schools, gliders, and aerobatic diving activities. The General Aviation airports in the region include Buckeye Municipal, Carefree Sky Ranch, Chandler Stellar Air Park, and Memorial Airfield, which is a Native American airport located on the Gila River Indian Community. In addition, the MAG Region also contains Luke Air Force Base, which is the major military airport located in the metropolitan area. However, due

to the fact that the facilities at Luke Air Force Base are maintained by the U.S. Department of Defense, and are considered to be outside of the purview of civilian airport development, it has not been inventoried and included within Table 3. However, the MAG Regional Airport System Plan update has identified the preservation of Luke Air Force Base as one of its primary objectives. As a result, the update is examining the airspace implications of civilian airport development to guard against projects that would interfere with the ability of the base to effectively carry out its mission.

TABLE 3

METROPOLITAN AIRPORTS IN THE MAG REGION - 2000

AIRPORTS	SIZE (Acres)	NUMBER OF RUNWAYS	LENGTH OF LONGEST RUNWAY	TOTAL BASED AIRCRAFT	TOTAL OPERATIONS	CLASSIFICATION
Buckeye Municipal Airport	640	1	4,300	55	90,000	General Aviation
Carefree Sky Ranch Airport	55	1	4,437	84	4,732	General Aviation
Chandler Stellar Air Park	25	1	4,005	152	40,880	General Aviation
Chandler Municipal Airport	394	2	4,850	392	249,811	Reliever
Glendale Municipal Airport	433	1	5,350	208	112,570	Reliever
Memorial Airfield	1,345	2	8,577	8	2,300	General Aviation
Mesa Falcon Field Municipal Airport	800	2	5,100	923	274,665	Reliever
Mesa Williams Gateway Airport	3,303	3	10,400	63	158,489	Reliever/Cargo
Phoenix Deer Valley Airport	674	2	8,200	1,206	370,779	Reliever
Phoenix Goodyear Municipal Airport	817	1	8,500	280	142,458	Reliever
Phoenix Sky Harbor International Airport	3,130	3	11,490	237	579,846	Commercial/Cargo
Scottsdale Municipal Airport	282	2	8,251	425	207,032	Reliever

Source: MAG Regional Aviation System Plan Update, September 2001

Although Phoenix Sky Harbor and Mesa Williams Gateway are presently the only two airports with significant air cargo facilities and functions, a number of other airports throughout the region could in fact emerge, or take on a larger role as an air cargo airport in the future. However, for purposes of tabulating and tracking specific forms of air cargo data, information pertaining to air cargo operations is only available for Phoenix Sky Harbor and Mesa Williams Gateway at this time. Specific information concerning air cargo is not available for individual airports within the metropolitan area, primarily due to the fact that other airports are not actively engaged in any significant air cargo operations. Further details concerning air cargo freight activities, and existing facilities located throughout the metropolitan area of the MAG Region will be addressed in Chapter Seven of this document.

PIPELINES

At present, the El Paso Corporation and the Southwest Gas Corporation are the only companies that are actively involved in the regional distribution of natural gas products for residential and commercial use. In addition to these companies, there is a primary metropolitan pipeline terminal facility located on the west side of the City of Phoenix. This facility is located near I-10 and stores refined oil and gasoline products that are transferred to trucks. It is the terminal for main pipelines that transport gasoline from the states of California and New Mexico, and contains a series of smaller pipelines that connect to Phoenix Sky Harbor International Airport and Luke Air Force Base. The facility is also supplied by a smaller gasoline line that extends south to the Tucson area, and ultimately into the State of Texas.

FREIGHT TERMINALS

As displayed on Map 3, there are a number of significant freight terminals located throughout the immediate metropolitan area. By definition, these are establishments that are primarily engaged in the handling and transfer of freight by trucks and freight carrying vehicles, and also provide maintenance and service for motor vehicles. According to the MAG Employer Database, there are a total of 43 significant terminals located within the metropolitan region. Based upon their standard industrial classification, these facilities are specifically identified and defined as "locations that are terminal and joint terminal maintenance facilities for motor freight."

The majority of these sites are operated by large couriers and trucking companies, and companies involved in the large-scale shipment of goods. As displayed on Map 3, the major freight terminals within the MAG Region are concentrated in west Phoenix, within areas of trackage owned by the Burlington Northern Santa Fe (BNSF) railroad, and in the vicinity of Sky Harbor International Airport. There are also minor concentrations of terminals located along several lines of the Union Pacific Railroad, located in the East Valley of the metropolitan area.

MAG Regional Freight Assessment

Map 3

REGIONAL FREIGHT INFRASTRUCTURE

CAVE CREEK
CAREFREE
PEORIA
SCOTTSDALE
SURPRISE
BNSF Railway
EL MIRAGE
YOUNGTOWN
PHOENIX
FOUNTAIN HILLS
PARADISE VALLEY
GLENDALE
BUCKEYE
LITCHFIELD PARK
TOLLESON
MESA
TEMPE
APACHE JUNCTION
Union Pacific Railroad
GUADALUPE
GILBERT
AVONDALE
CHANDLER
GOODYEAR
QUEEN CREEK
MARICOPA

- Freight Terminals
- Warehouses
- Intermodal Facilities
- Cargo Airports
- Existing Freeway/Expressway
- Planned Freeway/Expressway
- U.S. and State Highways
- Other Roads
- Railroad

MAP AREA

MARICOPA ASSOCIATION of GOVERNMENTS

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0 5 10 15 Miles

WAREHOUSES

Map 3 displays various warehouse facilities that are located throughout the MAG Region. By definition, warehouses are facilities that are primarily used for the storage and transfer of goods. The locations displayed on Map 3 have been identified through the MAG Employer Database, which includes a total of 60 warehouse facilities throughout the region.

In general, warehouses are facilities that are primarily owned by shippers, receivers, carriers, independent third parties, intermediaries, or companies that specifically provide space for goods and affiliated services. They essentially function as "points of transfer" as products make their way from raw materials to finished goods, and then on to the eventual customer in the distribution process. Although this is primarily the typical function of a warehouse, such facilities are becoming more diverse. For example, some warehouses are used to perform "value-added" services, such as the pricing of goods and the repackaging of goods prior to their delivery to stores and consumers.

The facilities located on Map 3 include warehouse functions associated with farm products, the refrigeration of stored goods, general warehousing activities, and specialized warehouse activities. The primary sites as displayed on Map 3 are distinguished from other common warehouse functions in that the identified warehouse establishments do not actually sell the goods. These identified sites do not include warehouse facilities that are typically associated with wholesalers, manufacturers, or any other use of a facility that is specifically utilized to directly sell a product. It is important to note that wholesalers, manufacturers and retailers all contain some form of warehousing function, and generate a specific amount of traffic associated with the receiving, distribution and selling of goods. Chapter Four of this document will address this information in further detail.

INTERMODAL FACILITIES

Within the MAG Region, intermodal freight movements involve a process that takes place over roads, rails, air, and by pipelines. By definition, the term "*Intermodal*" refers to the connecting of different modes of transportation, or the transferring of freight or people from one mode to another at facilities such as terminals, airports or stations. However, the purpose of this study is to focus upon freight movements, and therefore, the passenger component of intermodal movements will not be addressed. From a freight perspective, the term "*Intermodal*" is not a mode of transport, but is essentially a process of offering freight services by two or more modes of transportation in an effort to maximize the overall efficiency of moving goods.

Map 3 displays a number of identified Intermodal freight facilities located throughout the MAG Region. These facilities are also identified on Table 4. At present, there are a total of 11 facilities throughout the MAG Region that are classified as intermodal facilities. The primary functions of these facilities include intermodal rail, air cargo and

TABLE 4

INTERMODAL FACILITIES IN THE MAG REGION

NAME	SIZE	FUNCTION	MODES OF ACCESS
El Mirage Auto Distribution Center Burlington Northern Santa Fe Railroad	65 Acres	Intermodal Rail	Rail, Truck
Glendale Intermodal Yard Burlington Northern Santa Fe Railroad	38 Acres	Intermodal Rail	Rail, Truck
Glendale Freight Yard Burlington Northern Santa Fe Railroad	25 Acres	Intermodal Rail	Rail, Truck
Phoenix Team Track (9th Avenue) Burlington Northern Santa Fe Railroad	N/A	Intermodal Rail	Rail, Truck
Phoenix Sky Harbor International Airport	3,130 Acres	Intermodal Air Cargo	Air, Truck
Mesa Williams Gateway Airport	3,303 Acres	Intermodal Air Cargo	Air, Truck
Phoenix Yard Union Pacific Railroad	29 Acres	Intermodal Rail	Rail, Truck
Phoenix Team Track Union Pacific Railroad	N/A	Intermodal Rail	Rail, Truck
Phoenix Auto Yard Union Pacific Railroad	25 Acres	Intermodal Rail	Rail, Truck
Mesa Team Track Union Pacific Railroad	0.7 Acres	Intermodal Rail	Rail, Truck
Phoenix Pipeline Terminal Union Pacific Pipeline Partners	40-50 Acres	Intermodal Pipeline	Pipeline, Truck

Source: Maricopa Association of Governments; ADOT, State Rail Plan 2000

pipeline, and involve modes of access associated with pipelines, trains, trucks and airplanes. The intermodal freight movement process is a crucial function in the efficiency of transporting goods to, from, within and throughout the region. More

information on the importance, and function of intermodal facilities will be addressed throughout the remaining chapters of this document.

EXISTING TRAFFIC CONGESTION ISSUES

Traffic congestion within the MAG Region has a direct impact on the freight industry's ability to maintain efficiency. From an operations and logistics perspective, delays in traffic cause serious problems in the ability of a product to be picked up or delivered on time, and can also cost substantial amounts of money in expended fuel and time delays associated with labor costs and transport arrangements. Some of the primary factors contributing to traffic congestion within the MAG Region include tremendous population growth and a viable economy that is producing an increasing number of jobs. These factors have brought intensive urban development to previously undeveloped lands, thereby creating a higher demand on the existing regional roadway network and resulting in higher traffic volumes.

In addition to freight concerns, increased travel times and the decreasing available capacity of the existing system, traffic congestion has other consequences and affects upon the population of the metropolitan region as well. Aside from notable air quality issues, there are also cumulative effects on personal health, safety and the economy, such as driving under stressful conditions; stress-related physiological changes; health problems associated with driving anxiety; and work performance deficits and job dissatisfaction, which ultimately leads to lower levels of overall productivity and additional economic losses. Also, traffic congestion has been responsible for the increase in accidents, as well as the overall intensity of delays in the efficient movement of people and goods throughout the metropolitan region.[1]

During 1989, for the first time, MAG initiated a major traffic congestion study in an effort to develop an electronic database of detailed traffic information that could be used to measure traffic congestion at major intersections, and also for selected freeway segments throughout the metropolitan region. Due to population growth and extensive freeway construction over the past decade, which significantly altered regional travel patterns, the 1989 study was followed by the *1998 MAG Regional Congestion Study.* The 1998 study was specifically intended to provide updated traffic data for the MAG transportation planning process.

The primary elements of the 1998 study assessed traffic data collection; traffic volumes; vehicle types; levels of service; and the overall assessment of growth in metropolitan Phoenix between the years of 1989 and 1998. When addressing the issue of congestion, some of the more significant findings of the 1998 study include an analysis of "Levels of Service" conducted at 647 arterial intersections and various freeway segments throughout the metropolitan region, and a comprehensive comparison of VMT and overall daily capacity miles between the years of 1989 and 1998.

When considering overall intersection or roadway capacities, a "Level of Service" (LOS) is the most common measurement of assessing traffic conditions. The LOS is based on the ratio of the traffic volume to roadway capacity. A scale of A to F is utilized to determine LOS at intersections and freeway segments throughout the metropolitan region. In accordance with generally accepted transportation planning standards, a LOS of A, B or C is considered acceptable in terms of the road's ability to function well below levels of congestion. Roads with a LOS of A, B or C are considered under capacity, and are desirable in their ability to move traffic at an acceptable speed. When assessing congestion, a LOS of D is considered near full capacity, an E is considered at capacity, and LOS F is considered to be over capacity. A LOS of E or F is considered to be unacceptable for most drivers. As specified within the 1998 Study, when assessing LOS for intersections, AM peak traffic periods were defined as time intervals which occurred between the hours of 7:00 and 9:00 AM; whereas PM peak traffic periods were defined as those time intervals between the hours of 4:00 PM to 6:00 PM.[2]

TABLE 5

REGIONAL INTERSECTION LEVELS OF SERVICE (LOS)					
AM PEAK HOUR			PM PEAK HOUR		
LOS	Number of Intersections Analyzed	Percent	LOS	Number of Intersections Analyzed	Percent
A	15	2.3	A	15	2.3
B	81	12.5	B	87	13.4
C	144	22.3	C	124	19.2
D	170	26.3	D	166	25.7
E	135	20.9	E	127	19.6
F	102	15.7	F	128	19.8
Total	**647**	**100.0**	**Total**	**647**	**100.0**

Source: 1998 MAG Regional Congestion Study

Table 5 provides an overview of AM and PM peak hour LOS for the regional study area's surface arterial roadway intersections. The most notable observation from Table 5 is that the region is encountering a significant congestion problem on the major arterial road system. As displayed in the table, approximately 36.6 percent of regional intersections are congested during AM peak hour traffic, and 39.4 percent of all intersections within the study area are at capacity during PM peak hour traffic. Only 37.1 percent of the region's intersections are under capacity in the morning, and 34.9 percent in the evening.

When assessing LOS for regional freeways, AM peak traffic periods were defined as time intervals which occurred between the hours of 7:00 and 9:00 AM; whereas PM

peak traffic periods for freeways were defined as those time intervals between the hours of 4:30 PM to 5:30 PM.[3] As displayed on Table 6, approximately 24.7 percent of all freeway mile segments were functioning at LOS E or F, and were considered over capacity. This overall percentage was higher during the afternoons, when the figure rose to a total of 31.2 percent for all regional freeway segments. The overall levels in freeway congestion in the 1998 study represent a considerable increase over the congestion levels that were reported in the 1989 study.

TABLE 6

REGIONAL FREEWAY LEVELS OF SERVICE (LOS)
FOR GENERAL PURPOSE LANES ONLY

AM PEAK HOUR			PM PEAK HOUR		
LOS	Number of One-Way Miles	Percent	LOS	Number of One-Way Miles	Percent
A	19	8.2	A	16	6.9
B	43	18.6	B	44	19.0
C	74	32.0	C	61	26.4
D	38	16.5	D	38	16.5
E	21	9.1	E	34	14.7
F	36	15.6	F	38	16.5
Total	**231**	**100.0**	**Total**	**231**	**100.0**

Source: 1998 MAG Regional Congestion Study

Another significant conclusion of the 1998 MAG Regional Congestion Study indicates a 42 percent increase in the overall amount of VMT; a 95 percent increase in the number of freeway roadway capacity miles; and an 11 percent increase in the total number of arterial roadway capacity miles. When combining the total freeway and arterial miles, the overall increase in road miles from 1989 to 1998 has been about 29 percent. However, during this same period of time, the overall travel demand has grown by approximately 32 percent. The difference between these two particular growth rates has been one of the leading reasons for the levels of increased congestion. When analyzing the recent data, it is clear that peak hour freeway and arterial intersection traffic congestion levels will continue to increase. As the Phoenix metropolitan region continues to increase in overall population, higher levels of transportation congestion will more than likely spread to other areas of the region.

The increasing levels of congestion will continue to reduce the overall efficiency of moving people from one point to another, and also have affects upon the timeliness and delivery of goods and services throughout the region. Also, congestion may in fact increase the cost of shipping and receiving for companies that depend on reliable truck

service. This may contribute to a decision by a company or firm to relocate, which could result in a subsequent loss of jobs and tax revenue to a local municipality.

Chapter Footnotes

1. Maricopa Association of Governments, *MAG Congestion Management System Alternatives: Final Report*, April 1994.

2. Maricopa Association of Governments, *1998 MAG Regional Congestion Study*, Pages 34-48, September 2000.

3. Maricopa Association of Governments, *1998 MAG Regional Congestion Study: Executive Summary*, September 2000.

CHAPTER FOUR

FREIGHT IN THE MAG REGION

This chapter will provide an overview of freight within the MAG Region, and collectively consider the freight modes of trucking, rail and air cargo. Although pipelines are also considered part of the freight transportation industry, there is presently a lack of quantifiable data which is available for commodity assessment purposes at the regional level. The pipeline industry is very significant at the national and state levels. However, the transport of pipeline commodities represents a minor portion of the MAG Region's overall freight transportation industry, and their movements have not been tabulated within the contents of this study.

This chapter will identify a number of factors concerning the locations of where freight activities are concentrated; areas that have a tendency to generate freight trips; the types of goods being moved; and the nature of freight movements at the regional, state and national levels. The initial sections of this chapter will identify the means by which data is collected, and will also consider the importance of regional freight generators, the correlation between land use and freight activities, and consider the existence and anticipated growth of future community job centers. The purpose in identifying potential freight generators, addressing general land use information, and assessing information on regional job centers is to identify where the primary locations, or "concentrated areas" of potential freight activities are located throughout the MAG Region. Having a general understanding of this information contributes to a better outlook on existing and future areas of freight activity, and provides further insight into potential regional planning and transportation planning issues.

Also, this chapter will identify significant trade corridors, and provide specific information on regional freight flows and statistical freight data. In presenting and considering this overview, a nationally recognized database has been utilized, and specific forms of freight data have been considered. Specifically, the following sections of this chapter will assess the MAG 2000 Employer Database; regional freight generators; land use and freight; community job centers; regionally traversed routes; trade corridors of significance; and will also provide an in-depth overview of freight flows and commodity analysis within the MAG Region.

MAG 2000 EMPLOYER DATABASE

The MAG 2000 Employer Database was utilized to identify employment and freight-related site data as contained within this chapter. This information was used to compile Maps 4 through 7, which address MAG regional freight generators, manufacturers and wholesalers, and regional job centers. The employer database was prepared as part of the MAG GIS and Database Enhancement Project, which was initiated in 2000. The purpose of the MAG Employer Database was intended to create accurate, small-area estimates of base year employment, which could be utilized in MAG's socioeconomic projection and travel demand models. This information is also utilized in the analysis of regional transportation characteristics, for assessing regional planning and development, and for the analysis of a variety of employment trends and topics.

The MAG 2000 Employer Database was comprised through the development of a comprehensive methodology, which was utilized to create small-area employment estimates at the Traffic Analysis Zone (TAZ) level of geography. TAZ-level data included sub-categorized information on major land use categories, including office, retail, industrial, public and "other" land uses. Also, as part of this process, information was gathered for all employment sites throughout the MAG Region with more than 5 employees and for all commercial buildings, including floor area data for each building. This cumulative information was assembled, verified and geocoded into accurate, usable results.

The 2000 MAG Employer Database includes a total of 33,700 employer-sites that employ a minimum of 5 employees. The database captures the primary companies, or employers, which account for approximately 75 percent of all employment throughout the region. The remaining 25 percent of employment consists of smaller companies and individual businesses that employ less than five people. However, this segment of the labor force basically has minimal impact on freight-related employment throughout the MAG region.

The specific data contained within the MAG database includes primary and secondary company names; street and address information; the total number of employees at the location; and the Standard Industrial Classification (SIC) code for the main activity that is conducted at the location of each site. Development of the MAG 2000 Major Employer Database involved the collection of datasets purchased from Dun and Bradstreet, a national market research firm; data obtained from Harris Information's (a private firm) *Arizona Industrial Directory*, which was a manufacturing operations database developed with the assistance of the Arizona Chamber of Commerce; and additional source information obtained from Maricopa County's Trip Reduction Program (Ride Share) and the Arizona Department of Education. The 2000 MAG Major Employer Database is further categorized into nine industrial classifications.

The information within this chapter relies upon the findings of the MAG 2000 Employer Database. The database collection process as described is clearly representative of the most comprehensive information that is available for this type of employment and

location assessment. The MAG 2000 Employer Database is used in this chapter for identifying warehouses, trucking companies, freight terminals, manufacturers, wholesalers, air couriers and post offices. Aside from providing comprehensive employment data, the database was also very useful in displaying spatial patterns for a variety of freight-related activities throughout the region.

REGIONAL FREIGHT GENERATORS

Regional freight generators are sites, or specific locations that generate increased concentrations of freight trips and activities related to the shipping, receiving or storage of goods. Map 4, entitled *MAG Regional Freight Generators*, displays the primary locations throughout the MAG Region that generate a significant amount of freight activity based upon their function in the overall goods movement process. Map 4 provides a spatial overview of warehouses, trucking companies, freight terminals, manufacturers, wholesalers, air couriers and post offices. It is from these locations that the origins and destinations of many local and regional truck trips occur. Also, a number of these identified locations maintain very active rail, pipeline and air cargo functions that contribute to the overall movement of goods within and throughout the region. As specified within Chapter Two of this study, active participants and facilities in the freight process include shippers, receivers, forwarders, couriers, trucking firms, terminals, rail and pipeline freight facilities, and air cargo facilities. The location of these activities as displayed on Map 4 were identified through usage of the MAG 2000 Employer Database, which was described in the previous section of this chapter.

Warehouses have the potential to generate relatively high amounts of freight activity, as their primary role is basically intended to store goods that are moving through various stages of the goods movement process. This could involve storage at any stage or level, from a raw material to a finished product or products, and then on to final use or consumption by the consumer. The warehouses identified on Map 4 are directly associated with farm products, the refrigeration of stored products, general warehousing activities, and specialized warehousing activities. A total of 58 of these facilities are located on Map 4, which are concentrated along the BNSF and Union Pacific Rail corridors, the I-10/I-17 freeway corridors, and on the immediate west side of the City of Phoenix, located between 35th and 59th Avenues, south of the I-10 corridor.

Although the trucking freight mode will be addressed in further detail in the following chapter, Map 4 also identifies the locations of the primary trucking companies located throughout the MAG Region. In terms of their location, these identified firms are basically dispersed throughout various areas of the region, with concentrated areas of activity on the west side of Phoenix, between 35th and 75th Avenues, south of I-10; in the immediate vicinity of Sky Harbor International Airport; and along the I-10 and I-17 corridors in central Phoenix. Freight terminals are also displayed on the map, and are concentrated along the BNSF corridor, in the vicinity of Sky Harbor International Airport, and along several extensions of the Union Pacific Railroad.

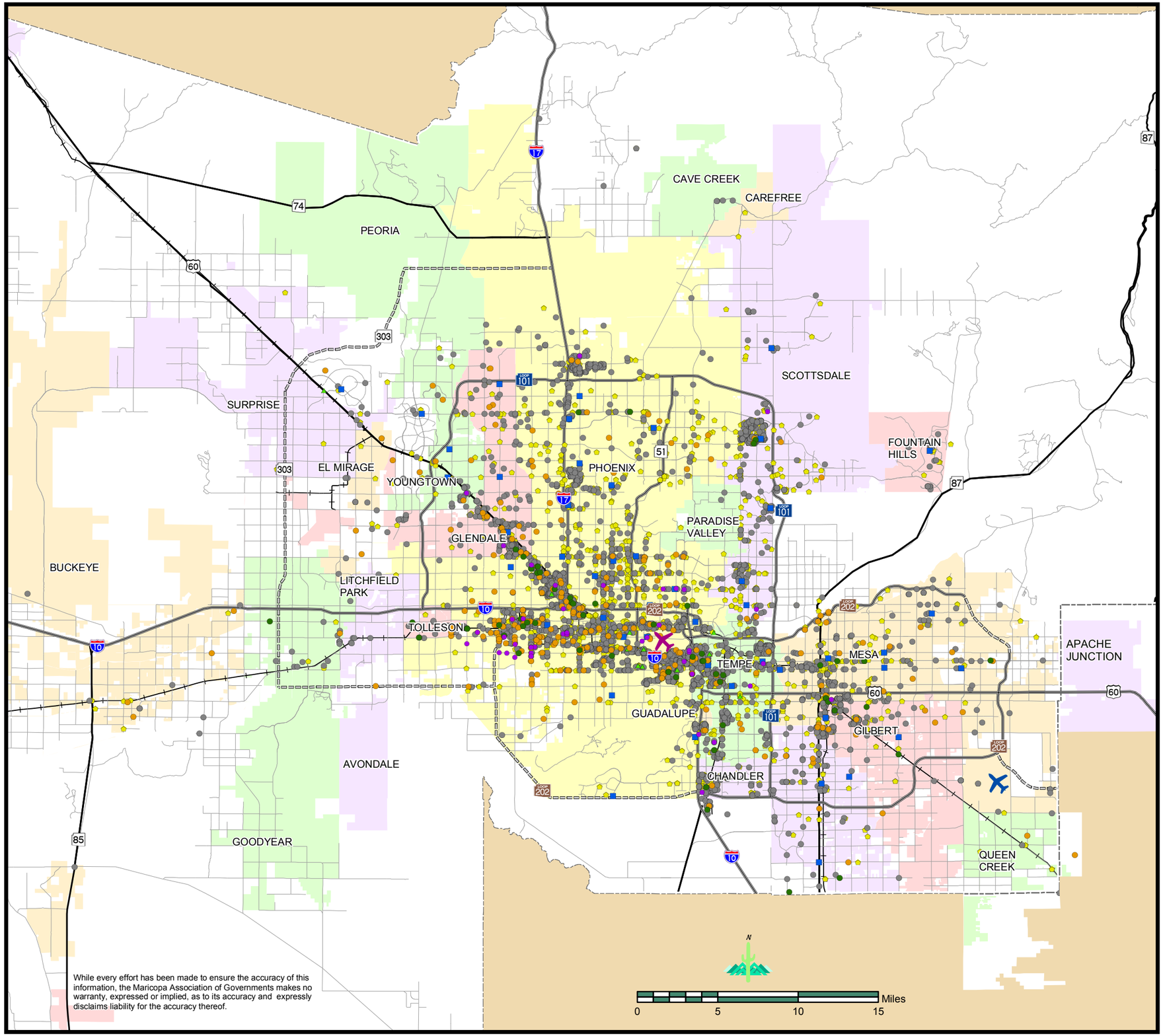
Maps 5 and 6, which are entitled *MAG Regional Manufacturers,* and *MAG Regional Wholesalers*, display the locations of all companies that employ between 5 and 49 people, and that also employ over 50 people. These locations are dispersed throughout the region, but have a tendency to be clustered along major arterial corridors, highway corridors, near Sky Harbor International Airport, and within industrial and commercially zoned areas.

According to the U.S. Census Bureau, the wholesale trade sector involves establishments that are engaged in the wholesaling of merchandise, generally without transformation, and render services incidental to the sale of merchandise. Whereas manufacturing is defined as an establishment that is actively engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products. Also, the assembling of component parts of manufactured products may also be considered as "manufacturing" per se. Typically, wholesalers sell merchandise to other businesses and normally operate from a warehouse or an office. Also, manufacturers usually maintain on-site warehouse facilities for the temporary storage of goods, components, materials and manufactured products. The presence of on-site warehouses, as well as wholesale and manufacturing activities will continue to assure a certain level of shipping and receiving activities from these particular facilities.

The warehouses displayed on Map 4 do not include warehouses that may be affiliated with wholesale and manufacturing activities.

Other identified freight generators in the region are air couriers and area post offices. The U.S. Census defines air couriers as those establishments that are primarily engaged in furnishing air delivery of individually addressed letters, parcels, and packages that are generally less than 100 pounds in weight. This does not include the U.S. Postal Service. Such companies deliver their consignment by air, but the initial pick-up and final deliveries are made by other modes of transport. There are a total of 14 identified air courier services on Map 4. In addition, the U.S. Postal Service also provides a means of freight transport throughout the region. The postal service includes all associated activities of the National Post Office, as well as a variety of subcontractors that are involved in the delivery of letters and small parcels. The locations of each post office are also identified on Map 4. Many firms rely on air courier services and the U.S. Postal Service for the rapid delivery of small packages that typically have time delivery deadlines associated with them. Although not thought of in terms of a traditional "freight movement" or movements whereby large quantities of a product or bulk substance are transported, the ground and small package delivery network still involves a significant amount of generated trips when assessing local deliveries and movements between local terminals and air cargo facilities, where packages are transported to other locations.

As identified, warehouses, trucking companies, freight terminals, manufacturers, wholesale facilities, air couriers and the local postal system represent some of the primary freight generators located throughout the MAG Region. Also, although not



MAG Regional Freight Assessment

Map 4

FREIGHT GENERATORS

- Warehouses
- Trucking Companies
- Freight Terminals
- Manufacturers
- Air Couriers
- Post Offices
- Wholesale Goods
- Sky Harbor Airport
- Williams Gateway Airport
- Existing Freeway/Expressway
- Planned Freeway/Expressway
- Other Roads
- Railroad

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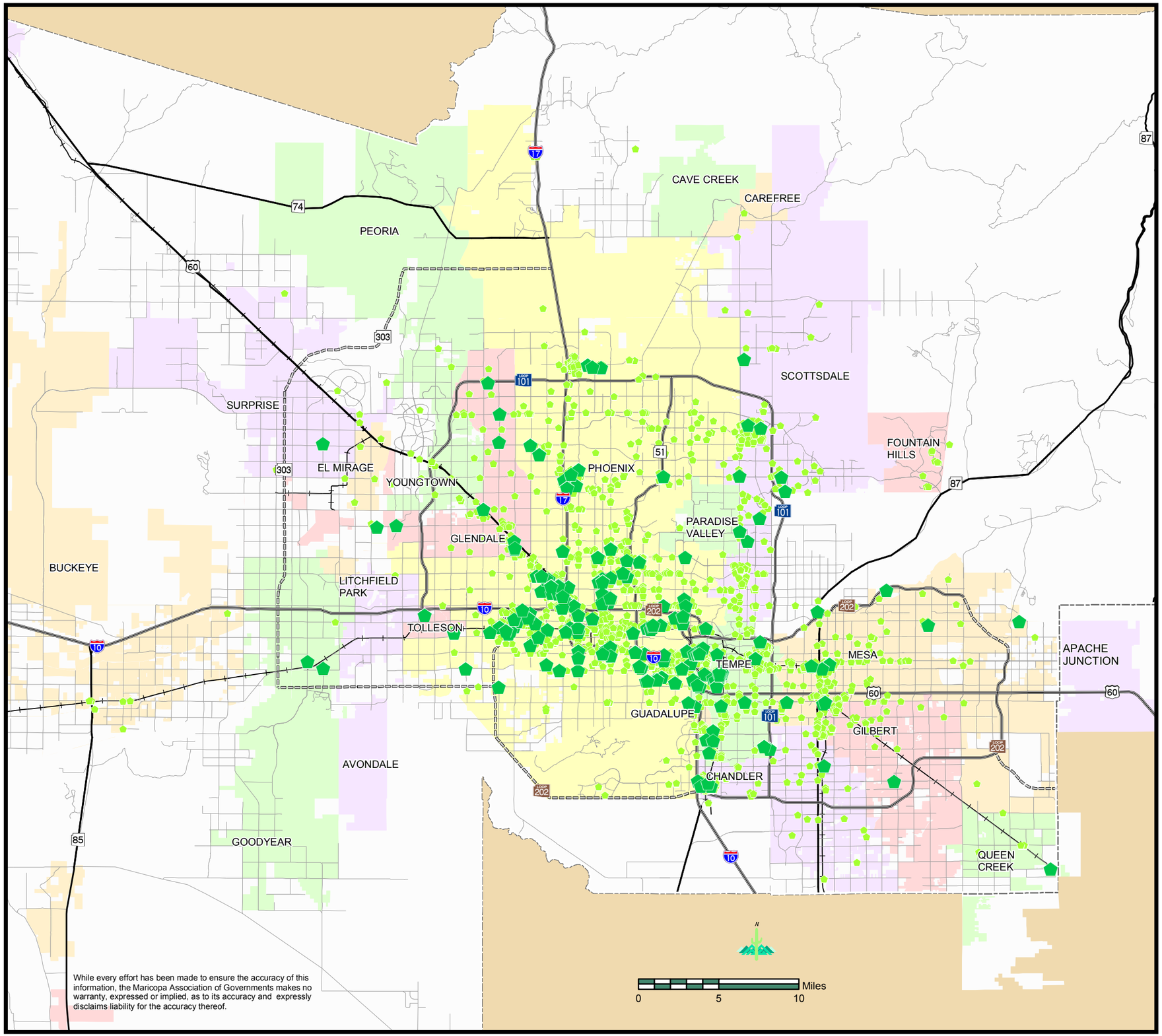

While every effort has been made to ensure the accuracy of this information, the Maricopa Association of Governments makes no warranty, expressed or implied, as to its accuracy and expressly disclaims liability for the accuracy thereof.

MAG Regional Freight Assessment

Map 5

WHOLESALERS

- More than 50 employees
- 50 or less employees
- Existing Freeway/Expressway
- Planned Freeway/Expressway
- Other Roads
- Railroad

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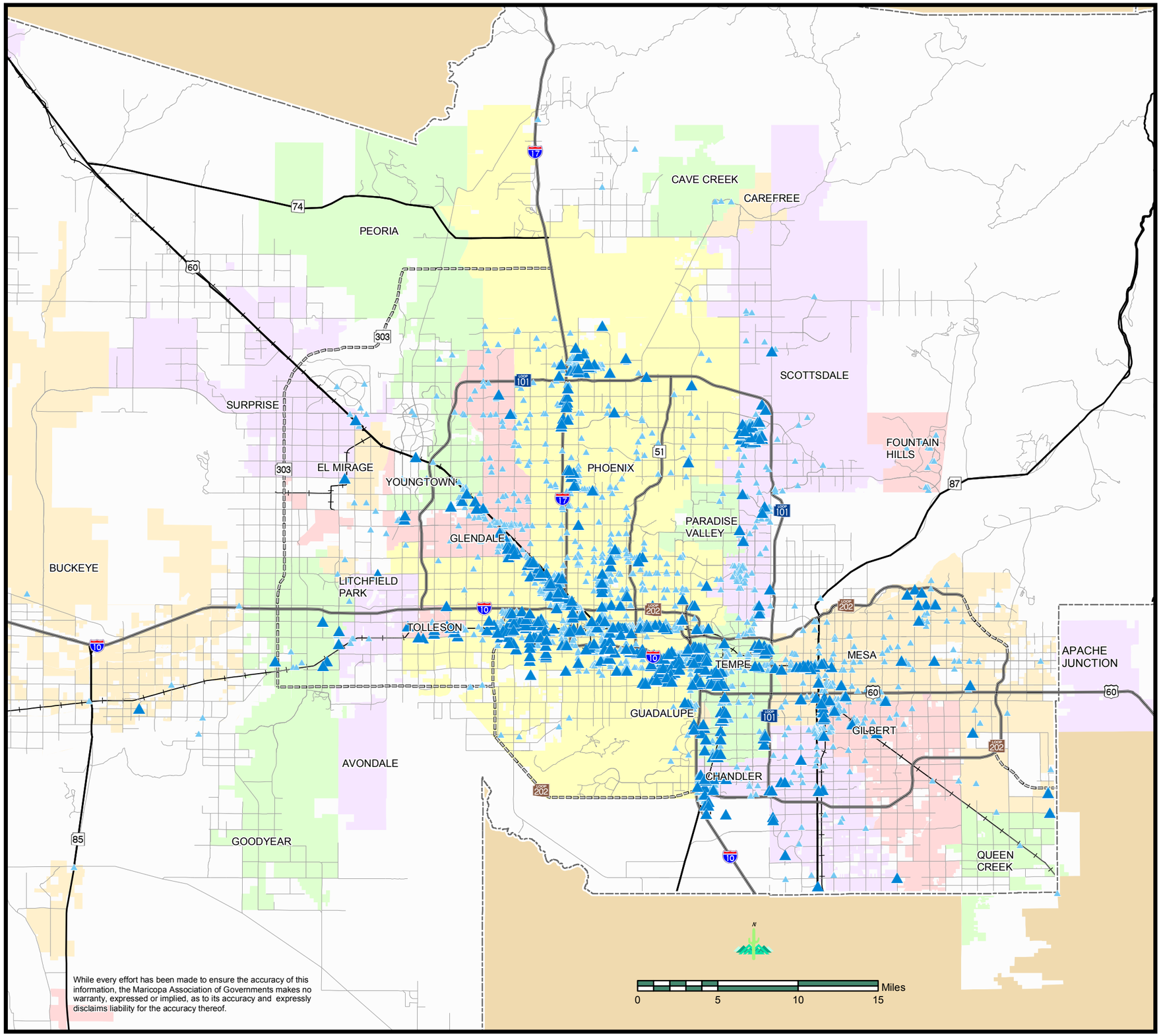
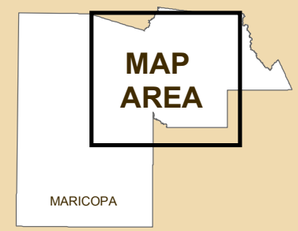


MAG Regional Freight Assessment

Map 6

MANUFACTURERS

- Over 50 Employees
- 50 or Less Employees
- Existing Freeway/Expressway
- Planned Freeway/Expressway
- U.S. and State Highway
- Other Roads
- Railroad



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specified in detail within this section, other freight generators of significance are the region's intermodal facilities and the primary air cargo airports, which are Sky Harbor International Airport and Mesa Williams Gateway Airport. These items were mentioned in Chapter Three, and will be addressed throughout the following chapters of this document.

The facilities identified in this section are sites that are responsible for generating a substantial amount of freight trips. From a transportation planning perspective, these facilities should warrant a certain level of consideration, especially when identifying their role as significant trip generators in the overall transportation network. Obtaining further knowledge of these locations, their activities, operations, and their potential for generating trips and utilizing transportation corridors would be extremely useful for congestion studies and transportation modeling efforts at both the local and regional levels.

LAND USE AND FREIGHT

Conceptually, the overall volume of goods produced and consumed primarily determines the demand for freight movement. The factors which affect freight demand are numerous, and can range from issues such as the location of facilities, to items such as trade agreements, just-in-time inventory practices, carrier-shipping alliances, warehousing factors, weight limitations and the costs of transporting various goods. Although there are many factors that influence the demand for freight, this section is focused on the spatial allocation of land uses, as well as areas of concentrated retail, and industrial and employment activities that generate a significant amount of trips. These are traditional land uses throughout the region that account for a large percentage of trip origins and destinations.[1]

The correlation between land uses and transportation-related activities have a direct impact on a variety of neighborhood, local, and regional mobility and accessibility issues. Land use factors directly affect overall travel behaviors, and have a substantial impact on areas related to land use densities; types of land use; roadway connectivity and design; parking; traffic flows and vehicular movement; and the overall Levels of Service (LOS) on transportation networks throughout the region. The correlation between land uses and specific freight activities are also a very important part of the land use-transportation scenario.

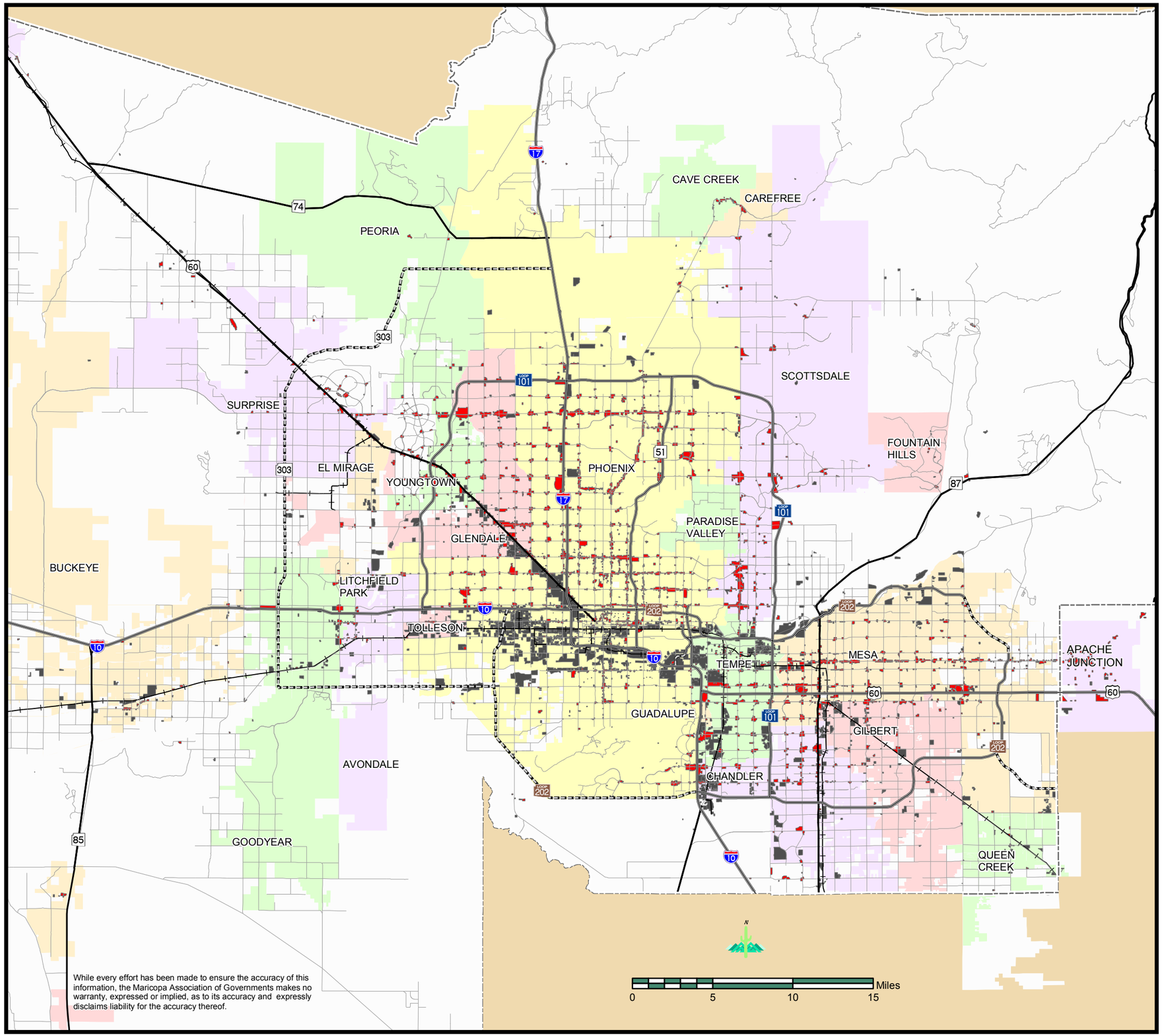
The majority of freight operations within the MAG Region are conducted at locations which are primarily zoned as acceptable land uses for commercial, industrial and manufacturing-related activities within their respective communities. These types of land use activities are typically situated along transportation corridors, or within designated geographic areas throughout the region, that are known for generating higher volumes of freight. Many trip-generation models and studies have shown that the primary trip origin and destination land uses for freight have involved manufacturing sites, terminals, warehouses, and areas of retail and wholesale activity. Also, there is a

considerable amount of traffic that is affiliated with the delivery of products to consumers within residential neighborhoods, as well as increased traffic volumes that are associated with the specific deliveries and pick-ups of small package items. A significant number of trips also occur through deliveries to construction sites located throughout the region.

Map 7, entitled *Existing Commercial and Industrial Land Use – 2000*, provides an overview of existing Commercial, Industrial and Business Park land uses. The commercial areas as displayed on Map 7 consist of all commercial types of land use, ranging from small neighborhood commercial establishments to large retail centers, and "super commercial" retail sites consisting of over a million square feet of use. The Industrial land use category displays all industrial lands that are specifically delineated and utilized for manufacturing and industrial-related activities at both the local and regional levels. The Business Park land use category displays all enclosed uses that pertain to industrial, office or retail activity within a planned environment. Such land uses contain planned business parks that could specifically consist of industrial, office or retail uses, or could in fact consist of mixed-use activities that are of a high intensity land use nature. According to the latest MAG land use inventory of existing municipal land uses, in 2000 the MAG Region contained a total of approximately 41 square miles of Commercial land use; 50 square miles of Industrial land use, and 13 square miles of Business Park land use.

As displayed on Map 7, commercial lands are primarily dispersed along major arterial road corridors throughout the region. The arterial grid network carries the majority of daily vehicle trips, and the existence of these particular commercial corridors are the source of higher levels of freight movements. In addition, the map displays large-scale Industrial and Business Park land uses. The primary industrial areas are geographically situated along the I-10 and Grand Avenue Corridors, with substantial areas also located in Tempe, Chandler and the west side of Phoenix. Also, several concentrated Business Park developments are situated in Scottsdale and in north Phoenix.

Maps 4 through 7 attempt to spatially display specific freight activity sites, and a variety of land uses that are conducive to higher concentrations of freight-related activities. The relationships between land use and freight-related infrastructure, sites, and activities have an overall impact on congestion and regional mobility. From a transportation planning perspective, having access to this type of information is not only helpful to understand existing conditions and needs, but is also helpful in predicting the impacts of new facilities, commercial developments, and other types of establishments on future traffic volumes, freight-related trip activity, freight facility needs, and accessibility and congestion issues at the local and regional levels.



MAG Regional Freight Assessment

Map 7

Existing Commercial and Industrial Land Use - 2000

Land Use

- Commerical
- Industrial
- Existing Freeway/Expressway
- Planned Freeway/Expressway
- Other Roads
- Railroad

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COMMUNITY JOB CENTERS

Local and regional land use patterns and the location of transportation corridors, major freight sites and concentrated areas of freight activity are all primary factors that should be considered in the goods movement process. From a spatial perspective, the integration of transportation and land use ultimately has a considerable impact on the congestion, accessibility, mobility, and the overall efficiency of local and regional transportation networks. One of the main areas of focus within this chapter is to provide an overview of freight in the MAG Region. Aside from considering commodity flows and the overall volumes of various products that move to, from, within and throughout the region, the identification of concentrated freight activity and modal freight movements is also an important element of assessing freight.

As displayed on Map 7, the lands that are often considered in the movement of goods and associated freight activities involve commercial and industrial-related land uses. When assessing the freight industry, it is important to identify these particular lands that attract freight-related activities, in order to obtain a comprehensive understanding of truck traffic volumes, trip information, related freight movements, and various sites and facilities. In addition to the identification of land associated with commercial and industrial uses, and primary freight sites, another element of consideration should include areas of concentrated employment activity. The concentration of employment is typically associated with higher density commercial and industrial activities, which also provides insight into the goods movement process.

During 2002, MAG's Regional Development Division coordinated efforts with municipal planning and economic development directors throughout the region in an attempt to identify and effectively inventory existing and future job centers. The reasons for this effort included a need to assist the Greater Phoenix Economic Council (GPEC) in developing and implementing an economic development strategy, focused on high quality employment clusters; and to provide technical assistance for the MAG Regional Transportation Plan, which focused on the identification of primary fiscal investment packages designed to improve the regional transportation network over a 20-year planning horizon.

MAG's intention was to collectively work with the members of GPEC in an effort to obtain specific information on jobs by industry cluster for the centers, which focused on the following economic clusters: Advanced business services; High tech electronics; Software; Aerospace and aviation; Biotechnology; Health services; Optics; Tourism; Transportation and distribution; Minerals and metals; Other basic and supplier industries; Agricultural and food processing; Plastics; Consumer industries; Education services, and Government. The collected data also assists with the transportation modeling component of the MAG Regional Transportation Plan process by providing valuable information on each of the following items: employment types at each job center; demographic data; existing and anticipated employment totals; floor area and total square footage of locations; existing acreage; and the total build out of each identified job center.

By definition, Community Job Centers are delineated areas at the local level, which are comprised of an identifiable concentration of employment activities and land uses that are entirely, or predominantly of a non-residential nature. Delineated Community Job Centers consist of concentrated, or mixed areas of industrial, office, retail, airport, and government land uses and employment activities. Due to their significant commercial and industrial base, many of these areas have a tendency to generate a higher level of freight-related activities throughout the MAG Region. Map 8, which is entitled *Community Job Centers*, displays a total of 106 job centers that are located within the MAG Region. These particular job centers are categorized into the following four categories: Developed Centers, Existing Centers with Expansion Potential, Future Centers without Infrastructure, and Revitalization Centers.

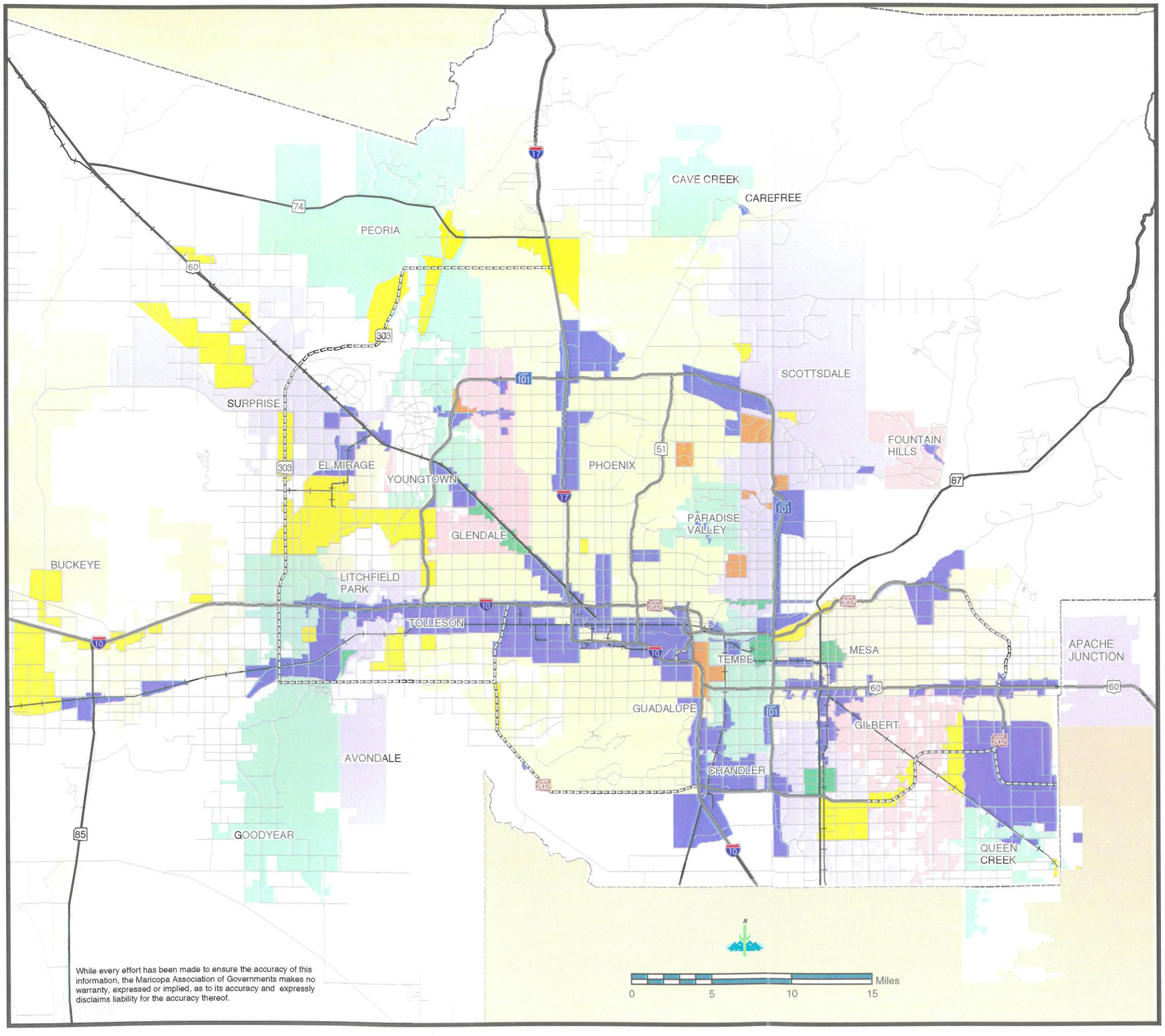
TABLE 7

MAG COMMUNITY JOB CENTERS
DEVELOPED JOB CENTERS

Job Center Name	Location (City/Town)	Total Acres (2000)	2000 Employment (Total Employees	Total Acres (Buildout)	Employment At Buildout (Total Employees)
Arrowhead Mall Area	Glendale	295	3,400	481	8,680
Southeast Goodyear	Goodyear	63	450	1,063	22,580
Southwest Goodyear	Goodyear	119	780	1,371	27,800
North Goodyear	Goodyear	250	880	1,134	10,870
Goodyear Airport Area	Goodyear	1,136	2,720	2,820	40,730
Paradise Valley Mall Area	Phoenix	544	9,070	561	9,210
Downtown Scottsdale	Scottsdale	636	17,150	678	19,790
McCormick Ranch Corridor	Scottsdale	391	10,540	474	18,680
Scottsdale Airpark	Scottsdale	1,594	25,870	1,998	36,760
Via De Ventura/ Doubletree Corridor	Scottsdale	287	8,190	287	8,190
Northwest Tempe	Tempe	1,980	52,110	2,149	56,060

Source: Maricopa Association of Governments

Developed Centers are essentially existing job centers, which are completely developed, or nearly developed, and contain all necessary on-site infrastructure, such as water, sewer, roads, communications and utilities. Table 7 provides a list of these identified job centers throughout the region, which are also displayed on Map 8. Existing Centers with Expansion Potential (see Table 8) are community job centers that currently maintain all necessary on-site infrastructure for commercial or industrial expansion, and have considerable available lands for further growth and development. Future Centers without Infrastructure (see Table 9) are community job centers that are planned, but do not yet have existing infrastructure. These areas are also identified on Map 8, and represent large expanses of available lands with the potential to become major centers of employment for the regional populace. As identified in Table 10, Revitalization Centers are defined as those centers which are the focus of ongoing community redevelopment efforts at the municipal level. Many of these centers are



MAG Regional Freight Assessment

Map 8

Community Job Centers

- Existing Center - Built-Out
- Existing Center - Expansion Potential
- Future Center - No Infrastructure
- Revitalization Center
- Existing Freeway/Expressway
- Planned Freeway/Expressway
- Other Roads
- Railroad

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located in established areas of their respective communities, and have been in existence for some time. Although this section focuses on 106 existing community job centers, MAG is currently in the process of identifying and classifying over 100 additional job centers, which will be completed by the end of 2005.

Tables 7 through 10 identify each of the community job center classifications, and provide specific information on each site's name; the site's municipal or government location; total existing size in acres; total number of employees in 2000; estimates determining the total buildout of each center in the future; and the total number of employees that are expected to be employed within each center at buildout. Although recent plans and population projections for the MAG Region are estimating a buildout of over 8 million people by 2040, it is believed that many of the existing centers with expansion potential, and the future sites as identified on Map 7 will be fully occupied by then.

In accordance with calculated totals, in 2000 there were approximately 830,000 people employed within the region's 106 job centers. In 2000, the existing community job centers consisted of 67,201 acres, or a total area of approximately 105 square miles. However, based on planning and economic development estimates, the total size and employment numbers for the 106 community job centers are expected to expand considerably. At buildout, the centers are expected to employ over 2.6 million people. When the existing, identified community job centers are completely built and occupied, it is anticipated that they will comprise a total of 167,071 acres, or an area of about 261 square miles.

In addition to the anticipated growth and expansion of regional job centers, the average density of each center is also expected to increase from a total of approximately 7,904 employed persons per square mile in 2000, to a total of approximately 8,812 employed persons per square mile at buildout. In an effort to determine the future concentrations of employment within each community job center, MAG implemented a study providing further analysis through the utilization of a Location Quotient Analysis. Essentially, Location Quotient Analysis is a common economic base analysis which is intended to provide a comparison between a selected and referenced geographic region. The location quotient was utilized to compare the overall community job center employment concentrations at each of the 106 sites within the MAG Region to the referenced base, which in this particular case represents composite employment characteristics for the entire region of Maricopa County.

Through the utilization of Location Quotient Analysis, MAG was able to identify ratios for each of the 106 community job centers. Through this analysis, a ratio of 1.0 represents a uniform density of employment concentration; whereas a ratio of less than 1.0 represents minimal employment concentrations, and a ratio of over 1.0 represents areas of significant concentration. When considering the economic cluster associated with *Transportation, Distribution and Wholesale Trade*, it was concluded that there was a significant ratio increase over the average ratio of 1.0 for a number of locations.

TABLE 8

MAG COMMUNITY JOB CENTERS
EXISTING JOB CENTERS – EXPANSION POTENTIAL

Job Center Name	Location (City/Town)	Total Acres (2000)	2000 Employment (Total Employees)	Total Acres (Buildout)	Employment At Buildout (Total Employees)
North Avondale	Avondale	86	880	2,060	48,180
Baseline/SR 85	Buckeye	165	70	1,406	20,930
Southern/Apache	Buckeye	292	440	1,020	14,620
Carefree City Center	Carefree	66	800	100	1,170
North Chandler	Chandler	488	5,240	776	9,200
Price Corridor	Chandler	856	11,410	2,456	41,840
West Chandler	Chandler	2,049	22,860	3,106	34,310
El Mirage	El Mirage	118	760	220	2,320
Fountain Hills	Fountain Hills	182	1,730	291	5,210
Northern Borderlands	Gila River IC	617	2,130	2,932	46,710
Vee Quiva Casino	Gila River IC	23	70	37	170
Northwest Employment Area	Gilbert	1,028	12,990	1,763	28,330
Talavi Business Center	Glendale	419	5,820	575	10,640
Midwestern University Area	Glendale	101	1,150	224	2,830
Thunderbird Area	Glendale	77	400	123	1,280
Falcon Field Airport	Mesa	1,520	9,650	4,432	36,170
Fiesta Quadrant	Mesa	1,030	18,260	1,092	19,270
Union Pacific Business Corridor	Mesa	1,203	15,880	1,263	16,580
Superstition Freeway Corridor	Mesa	773	10,460	1,064	14,110
Superstition Springs	Mesa	1,111	11,740	3,059	38,810
Williams Gateway Airport	Mesa	3,302	6,500	15,476	114,730
Paradise Valley	Paradise Valley	329	1,610	354	1,730
South Peoria	Peoria	434	4,980	1,370	22,940
Bell Road/Sports Complex	Peoria	171	3,630	390	5,630
Deer Valley	Phoenix	2,922	30,290	6,158	118,600
North I-17	Phoenix	2,905	37,830	3,136	43,320
Desert Ridge/Kierland	Phoenix	1,493	3,230	3,031	32,700
Camelback Corridor	Phoenix	577	24,870	577	24,870
Gateway	Phoenix	155	4,650	279	7,750
Downtown Phoenix	Phoenix	618	49,330	738	73,750
North Central Avenue	Phoenix	1,388	61,390	1,477	66,210
Sky Harbor Airport	Phoenix	4,955	58,610	5,632	76,500
Phoenix Broadway Curve	Phoenix	600	12,120	888	15,790
Southwest Phoenix	Phoenix	5,962	44,680	10,196	155,090
South Central Industrial	Phoenix	1,959	26,680	2,197	38,980
Phoenix Grande Avenue	Phoenix	2,500	30,020	2,773	36,300
South Mountain Foothills	Phoenix	747	10,170	965	12,840
Queen Creek Gateway Area	Queen Creek	137	560	2,340	27,710
Town Center	Queen Creek	39	140	290	6,200
Rittenhouse/Ocotillo	Queen Creek	50	50	111	1,870
Ocotillo/Vineyard	Queen Creek	0	0	170	1,030
101 Corridor	Salt-River PM IC	340	2,660	2,849	18,820
101/202 Interchange	Salt-River PM IC	328	2,600	1,108	15,790
Perimeter Center	Scottsdale	272	2,390	875	10,570
Mayo Clinic Area	Scottsdale	39	3,000	91	3,670
Original Townsite/Surprise Ctr.	Surprise	177	1,520	1,032	23,310
South Dysart Road	Surprise	0	0	1,394	17,580
Del Webb Hospital	Surprise	79	3,200	93	3,300
ASU Research Park	Tempe	413	4,610	534	7,960

(Continued)

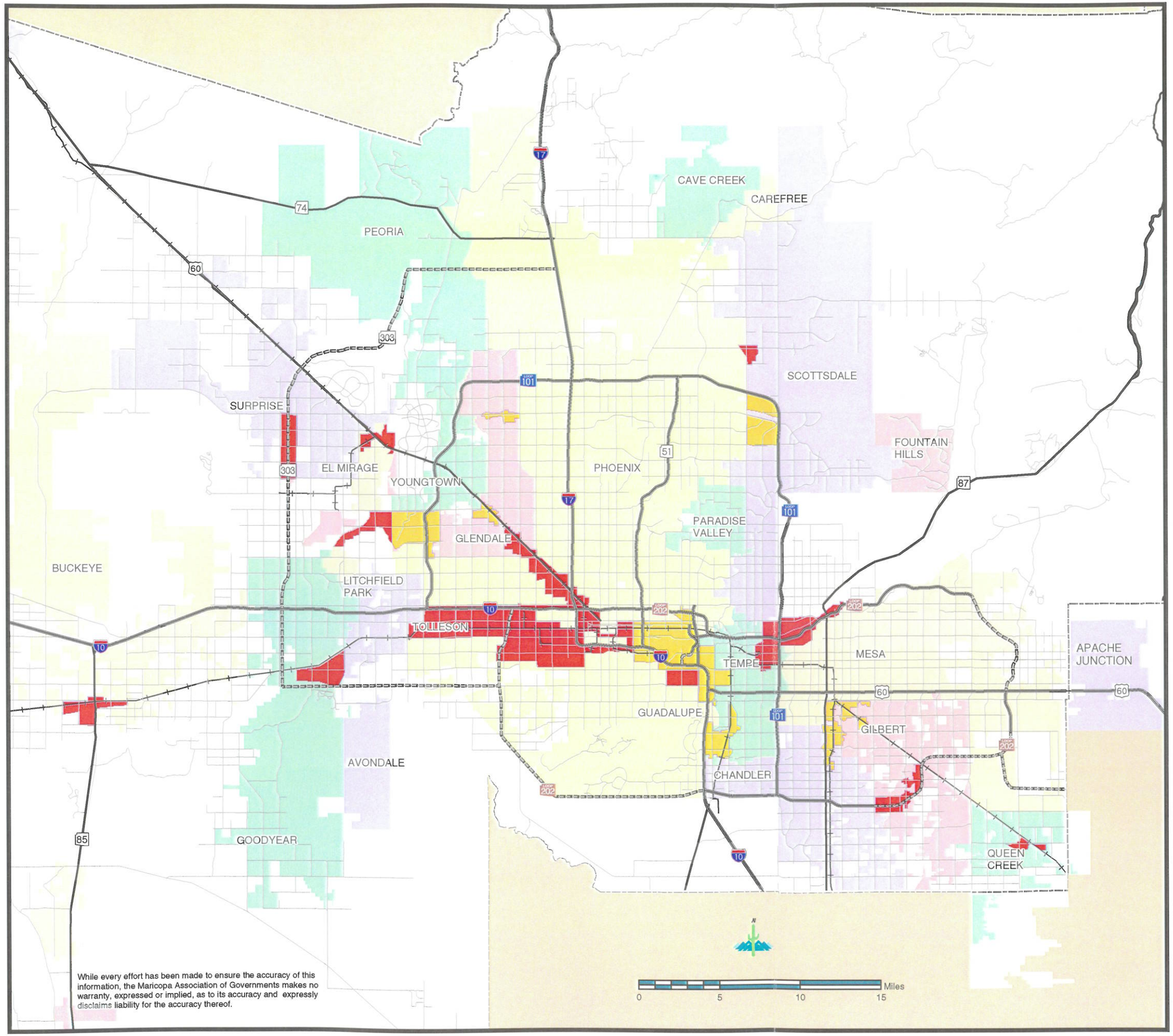
Job Center Name	Location (City/Town)	Total Acres (2000)	Total Acres (Buildout)	2000 Employment (Total Employees)	Employment At Buildout (Total Employees)
Southwest Tempe	Tempe	1,474	21,130	2,082	34,140
Downtown Tempe	Tempe	550	15,600	585	20,020
Papago Park Center	Tempe	190	5,300	306	17,030
Rio Salado Parkway	Tempe	28	1,420	90	9,780
Tolleson	Tolleson	1,215	10,340	2,980	48,960

Source: Maricopa Association of Governments

Based on this finding, it was determined that there will be a highly concentrated area of *Transportation, Distribution and Wholesale Trade* employment (See Map 9) in the existing commercial and industrial corridor along I-10, from the vicinity of the US 60 (Superstition Mountain Freeway) transition and Sky Harbor International Airport in the east, to the far western area of the I-10 Corridor, which is located at the Loop 101 transition. To the east of the Phoenix Central Business District, this concentration of activity is located within one mile of the freeway. To the west of the Phoenix Central Business District, this area of concentration extends anywhere from 2 to 4 miles south of I-10, and to the north, is concentrated within one mile of the freeway.

Other areas of concentrated *Transportation, Distribution and Wholesale Trade* employment that were identified as part of this process include the area located within a three mile radius of the intersections of the Loop 101 and Loop 202 (Red Mountain) freeways. This area comprises portions of Scottsdale, Tempe, Mesa and the Salt River Pima-Maricopa Indian Community. Although there are isolated pockets of concentrated activity throughout the MAG Region, the I-10 Corridor and the Loop 101/Loop 202 intersection represent the highest areas of concentrated employment, commercial and industrial activities associated with the transportation, distribution and wholesale trade economic clusters.

The community job centers displayed on Map 8, and identified in Tables 7 through 10 of this Chapter, represent areas within the region that will have the highest concentrations of employment, and in many cases, the highest concentrations of commercial and industrial uses. These identified areas of concentration are generally associated with increased levels of freight. Although more specific survey data, trip data, and further transportation modeling efforts are required to determine accurate capacity and truck traffic information, it is certain that the overall increases in concentrated freight activity along the I-10 corridor will result in a significant increase in the number of truck trips.



While every effort has been made to ensure the accuracy of this information, the Maricopa Association of Governments makes no warranty, expressed or implied, as to its accuracy and expressly disclaims liability for the accuracy thereof.

MAG Regional Freight Assessment

Map 9

Transportation, Distribution and Wholesale Trade Industry Cluster

Location Quotient Values

- 0.99 - 2.07
- 2.08 - 17.51
- Existing Freeway/Expressway
- Planned Freeway/Expressway
- Other Roads
- Railroad

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TABLE 9

MAG COMMUNITY JOB CENTERS
FUTURE JOB CENTERS – NO INFRASTRUCTURE

Job Center Name	Location (City/Town)	Total Acres (2000)	2000 Employment (Total Employees	Total Acres (Buildout)	Employment At Buildout (Total Employees)
Government Complex/ 115th Avenue Corridor	Avondale	73	600	467	8,120
West Buckeye	Buckeye	585	280	7,749	125,990
I-10/Lower Buckeye	Buckeye	42	170	1,505	28,980
Yuma/Watson	Buckeye	0	0	127	2,580
North Buckeye	Buckeye	181	0	2,318	37,290
Whitestone	Buckeye	0	0	32	510
Airpark Area	Chandler	644	970	3,082	47,370
Regional Mall Area	Gilbert	7	130	1,046	13,540
Power Road/Gateway	Gilbert	54	360	1,700	39,560
Gilbert/Germann	Gilbert	20	60	795	18,470
Loop 303/Peoria	Glendale	0	0	87	770
Loop 303/Northern	Glendale	72	90	413	9,220
Luke Compatibility Area	Glendale	1,988	10,520	3,810	26,280
Western Area	Glendale	961	2,780	3,527	64,180
Future Industrial	Glendale	663	730	1,433	15,660
City Center	Goodyear	0	0	409	4,600
Red Mountain Business Corridor	Mesa	599	1,890	918	7,880
North Central Peoria	Peoria	0	0	1,745	26,300
Carefree/Lake Pleasant	Peoria	12	140	1,203	23,050
Northwest Peoria	Peoria	134	900	2,015	43,470
North Black Canyon	Phoenix	107	10	1,238	38,710
Future South Mountain Loop	Phoenix	25	30	557	21,310
Phoenix Loop 101	Phoenix	26	270	864	35,620
Camelback/19th Avenue	Phoenix	167	5,000	167	5,000
Buckeye/107th Avenue	Phoenix	53	80	590	14,960
I-17 and Carefree highway	Phoenix	0	0	1,356	43,540
Riggs/Meridian	Queen Creek	0	0	62	500
Rittenhouse/Meridian	Queen Creek	17	70	225	3,620
Future Job Center	Scottsdale	33	350	205	2,740
Rawhide Area	Scottsdale	208	2,720	500	5,680
SR 303 Corridor	Surprise	17	30	851	29,920
Jomax-Grand Avenue	Surprise	84	90	906	23,770
Northwest Job Center	Surprise	35	100	953	27,420
West Job Center	Surprise	9	110	5,041	61,570

Source: Maricopa Association of Governments

When considering future urban structure, there may be a need to identify an alternative truck route, or reliever freeway to accommodate future traffic volumes along the I-10 Corridor. The increase of truck traffic and freight-related activities along the corridor will effect traffic, and make it necessary to address a variety of issues. Some of these concerns pertain to existing freight facilities and their overall levels of efficiency in the goods movement process; the impact of traffic on the arterial road network; the condition of connector roads to existing and future freight facilities; and the need to improve infrastructure associated with connector roads in the areas of identified concern.

TABLE 10

MAG COMMUNITY JOB CENTERS
JOB REVITALIZATION CENTERS

Job Center Name	Location (City/Town)	Total Acres (2000)	2000 Employment (Total Employees	Total Acres (Buildout)	Employment At Buildout (Total Employees)
Southwest Avondale	Avondale	38	590	201	5,110
Downtown Chandler	Chandler	933	5,570	1,124	8,090
City Center	Glendale	411	3,640	662	10,270
Glendale Grand Avenue	Glendale	951	6,670	1,149	11,510
Downtown Mesa	Mesa	688	9,160	715	10,000
Los Arcos/McDowell Corridor	Scottsdale	552	9,710	655	12,580
McClintock-Apache Corridor	Tempe	925	10,390	1,087	14,240

Source: Maricopa Association of Governments

TRADE CORRIDORS OF SIGNIFICANCE

Throughout the United States, the national interstate system is a vital component in the overall goods movement process, and allows for the efficient and timely movement of goods from one region of the country to another. As specified in Chapter Two, the primary method for transporting freight within the United States is by means of truck transport. In accordance with findings obtained by the U.S. Department of Transportation, the average length of a haul for a full truckload vehicle is 280 miles, and the average distance traveled for a less-than-truckload haul has been identified at 575 miles. Therefore, levels of efficiency along these corridors must be maintained at all times in order to facilitate goods movement, and to also sustain the national economy.

As identified, the MAG Region contains a number of important interstate road corridors throughout the region that are key segments of the overall national interstate system. Although these corridors are vital from a national perspective, they also play a significant role at the state and regional levels. The MAG freeway system is closely integrated with state and national highways, and the primary arterial road network.

Since the passage of the North American Free Trade Agreement, there have been a number of national efforts to take full advantage of free trade; to identify a variety of economic opportunities; and to also enhance regional and national freight mobility through the identification of corridor-driven routes of transport. Aside from maintaining a primary focus on national interstates, some of these efforts have also considered broader "trading arenas" and have addressed the concept of goods movement along existing rail lines, and existing state and national highways. Several of these efforts have included the State of Arizona in their studies, and more specifically, the MAG Region, in their overall goal of enhancing freight mobility and maximizing economic gain. These recent efforts have primarily resulted from the passage of the North American Free Trade Agreement, and are in various stages of development.

The North American Free Trade Agreement (NAFTA) was implemented on January 1, 1994, and has had a direct impact on the movements of goods throughout the State of Arizona and the MAG Region. The primary objective of NAFTA was to eliminate barriers in trade, and facilitate the cross-border movement of goods and services between the United States, Mexico, and Canada. NAFTA was intended to promote fair competition in trade by lowering tariffs and increasing investment opportunities between the countries. The implementation of NAFTA has led to the enhancement of numerous port facilities along the border of Mexico, and has resulted in a considerable increase in the number of trucks that are transporting goods.

Although the MAG Region ships and receives a considerable amount of goods to the nation of Canada, since the implementation of NAFTA in 1994, the primary trading partner has been the nation of Mexico. According to the U.S. Department of Commerce, and the Bureau of Transportation Statistics, in 1996 approximately 68 percent of all US imports from Mexico were transported by truck; 17 percent by rail; 3 percent by air; and the remainder of imports were transported between coastal seaports in the United States and Mexico. The primary corridors that have developed as a result of NAFTA are concentrated throughout the southern border states of California, Arizona, New Mexico and Texas.

In the State of Arizona, some of the primary routes for goods movements have been I-8, I-10, I-17 and I-40. Within the MAG Region, the I-10 and I-17 corridors have carried a considerable amount of Mexican trade over the last 9 years. Realizing the importance of these corridors in the movement of goods from Mexico into the southern United States, and into the State of Arizona, there have been a number of ongoing corridor studies and transportation-oriented regional freight efforts to maximize efficiency with regard to goods movements. For example, the National I-10 Freight Corridor Study was initiated during October of 2001 to develop a national plan of corridor improvements throughout the United States. This study was initiated by eight states along a 2,460-mile contiguous highway corridor containing segments of I-10, which also includes Arizona. The study's primary goal is to develop an efficient and reliable transportation system to enhance the movement of goods in domestic and international trade.

Within the MAG Region, some of the suggested improvements to ensure freight efficiency along the I-10 corridor include enhanced capacity; permanent weigh stations; the implementation of a functional ITS (Intelligent Transportation System) along the entire corridor; improved connectivity; better truck and vehicle separation; the development of DOT maintenance yards along the corridor; and the construction of new bypasses. The I-10 Corridor study was initiated through a collective effort of each of the state Departments of Transportation (DOT). Once completed, the study is intended to reduce congestion, enhance safety, and improve traffic flows.

Aside from the National I-10 Freight Corridor Study, in 1998 the Governor of Arizona signed an Executive Order to establish a task force to establish the Canada-Mexico (CANAMEX) Corridor through the state. This process was initiated by the Governor's

Office in an effort to enhance the efficient flow of goods, services, people and information between the United States and the nations of Canada and Mexico. The MAG Regional Council officially approved a resolution for the future designation of the CANAMEX Corridor through the MAG Region on November 1, 2000. The Regional Council subsequently adopted the corridor during April of 2001.

The adopted CANAMEX Corridor within the MAG Region traverses the region from the southeast along I-8, and then turns north on to State Route 85 to I-10. From the junction of I-10 and State Route 85, it travels west to Wickenburg Road, and then north along Vulture Mine Road, where it continues north and west around the Town of Wickenburg via the Wickenburg Bypass. It exits the MAG Region to the northwest of Wickenburg, where it connects to U.S. Highway 93. In its entirety, the CANAMEX Corridor enters the United States along I-19 at Nogales, Arizona, and extends north through I-10 to I-8, where it bypasses metropolitan Phoenix through the MAG Region, and travels along U.S. Highway 93 to Las Vegas, Nevada. From there, it follows I-15 north through the states of Utah, Idaho and Montana, on its way to Alberta, Canada. The CANAMEX Corridor was envisioned as a primary north-south route throughout the western U.S., which allowed for the safe, efficient, and expedient movement of goods across the North American continent for purposes of enhancing Interstate Commerce and maximizing economic benefit among the nations. The direct impact of this Corridor within the MAG Region is yet to be determined.

Another recent Corridor-based concept of significance is the *Southwest Compact*. This effort, initiated by the Southern California Association of Governments in Los Angeles, California, envisions a "Southwest Compact" comprised of the U.S. States of Arizona, California, New Mexico and Texas, as well as the Mexican States of Baja California, Sonora, Chihuahua, Coahuila, Nuevo Leon and Tamapaulipas. The purpose of this effort is to maximize economic potential, enhance free trade, and establish a more efficient intermodal goods movement system along the U.S. – Mexico border that is intended to facilitate economic linkages within the region. This effort not only assesses road networks, but also provides for an analysis of water port facilities, and establishes measures to enhance rail activities and air cargo possibilities between major metropolitan regions. Although the concept of a "Southwest Compact" is still in the process of development, it represents yet another opportunity to enhance goods movement through the expansion of transportation networks, infrastructure development, and the upgrading of freight facilities.

Collectively, NAFTA has enhanced the flow of goods by eliminating barriers to free trade, and has ultimately changed the frequency, and methods by which freight movements take place between the U.S., Mexico and Canada. Within the MAG Region, the primary Interstate highway routes of I-8, I-10 and I-17 will continue to play a significant role in the local, regional, state and transcontinental movements of goods, as well as play an important role in the flow of freight between the nations of Mexico and Canada. Considering the fact that there have been recent attempts for corridor improvements and the creation of enhanced trading efforts, MAG is in a position to benefit from such efforts through potential transportation infrastructure development and

corridor improvements; enhanced multimodal facilities; economic multiplier effects associated with the freight industry; and from residual trading accommodations and partnerships that may arise within the public and private sectors.

FREIGHT FLOWS AND COMMODITY ANALYSIS

Thus far, this Chapter has identified regional freight generators, addressed the relationships between land use and freight, and identified community job centers in an effort to identify areas of primary freight activity. Also, regionally traversed routes and trade corridors were identified to address potential or significant travel patterns in the actual movement of freight to, from, within and throughout the region. However, the purpose of the following section is to provide further detail on the actual commodity movements that significantly impact the MAG Region (Maricopa County). The following information will address the nature of the data that MAG utilized to analyze commodities and freight flows, and will also address geographic regions of significant trading at the state and national levels, and also between the MAG Region and the Nation of Mexico.

TRANSEARCH Database

In an attempt to gain a better understanding of freight, and to further assess the nature and significance of the freight industry within the region, MAG purchased the comprehensive TRANSEARCH database from Reebie Associates of Stamford, Connecticut, during April of 2003. The Reebie Associates' TRANSEARCH database is a nationally recognized source of high-quality freight data. Reebie provides accurate, up-to-date commodity and freight flow data to a variety of local, regional, and state governments throughout the United States, and is also considerably active at the Federal level with the U.S. Department of Transportation.

A customized version of the TRANSEARCH database was purchased for Maricopa County, and provides a considerable level of detail for commodities and freight flows by mode to other regions of the United States, and throughout the State of Arizona. The MAG TRANSEARCH dataset is based on a compilation of specific and analytical freight information, which utilizes a base year of 2001 for analysis purposes. The database provides detailed information on the number of tons moving into and out of the region, and is focused on the primary categories of freight modes, commodities, and the origin and destination of goods.

The Reebie TRANSEARCH database provides commodity flow data for the region by trucking, rail, and air cargo movements. The data specifically identifies the top commodities that are transported by freight mode, identifies the amount and type of goods that are transported to other regions, and also analyzes commodities that are received from other destinations throughout the United States. All transported commodities are reported by Reebie in terms of their identified Standard Transportation Commodity Classification (STCC). This is a comprehensive, 4-digit classification

system that is used to identify the leading commodities that are shipped and received within the MAG Region. Another important aspect of the database is its ability to provide specific freight flow information by points of origin and destination. This data is tracked for a variety of internal and external geographic regions. For purposes of analysis, MAG was able to identify freight movements in and out of Maricopa County to other areas of the United States, and has grouped this data (as delineated by Reebie Associates) into the geographical regions of the West, Midwest, South, Mid Atlantic, and New England. This information is also provided at the State level, between the MAG Region and the other 14 counties located within Arizona.

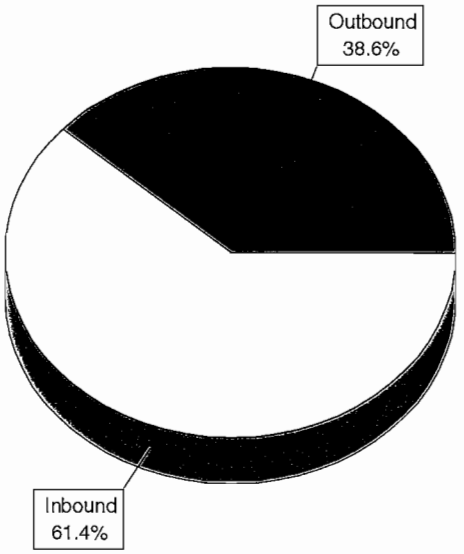
The following information provides a general overview of freight within the MAG Region, and focuses on freight flows, major trading areas, commodity analysis, and trade with Mexico. Although it is possible to complete very specific and detailed analyses with the use of the Reebie TRANSEARCH database, this section is intended to provide a broad, aggregate overview of freight-related data. Additional commodity flow information that is specific to the individual modes of trucking, rail and air cargo will follow in subsequent chapters.

Freight Flows

Figure 4 provides an overview of total freight flows in the MAG Region by the type of movement. For example, in 2001, 61.4 percent of all aggregate freight that was hauled by truck, rail, or air was received into the region from other destinations outside of Maricopa County. A total of 38.6 percent of all transported freight in the region was shipped out to other destinations throughout Arizona and to other areas of the country. This information indicates that Maricopa County and the Phoenix metropolitan area receives more goods and products from outside of the region, than it generates internally and distributes to other regions. Also, as displayed by Figure 5, when considering all aggregate freight flows that take place into, out of, and within the MAG Region, 86.1 percent of all movements take place by truck, 13.3 percent occurred by rail, and the remaining 0.6 percent was generated by air.

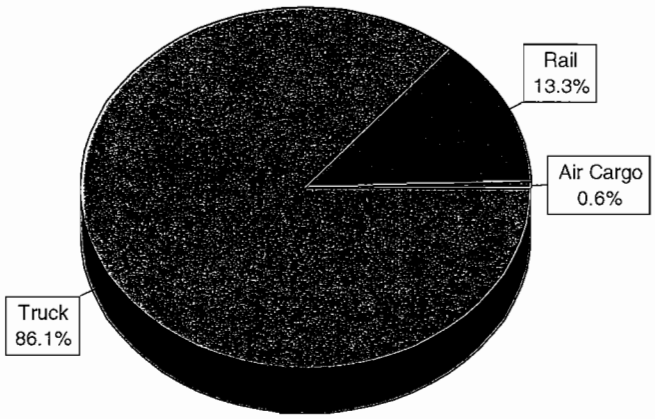
When considering a mode split analysis of MAG freight movements, Figures 6 and 7 display a percentage breakdown of all inbound and outgoing freight in 2001. Figure 6 displays all incoming freight to the MAG Region from other regions of the United States, as well as freight received from other counties within the State of Arizona. Figure 7 displays information for all outgoing freight from the MAG Region to all other 14 counties within Arizona, and to all other regions of the country. According to Figure 6, in 2001, 80.2 percent of all incoming freight was transported by truck, 19.1 percent was transported by rail, and the remaining 0.7 percent was shipped by air. Also, according to Figure 7, which displays the total amount of freight shipped from the MAG Region to other areas, in 2001 a total of 95.5 percent of all freight movements were transported by truck, 4.1 percent were transported by rail, and the remaining 0.4 percent of freight was shipped out by air. When viewing the overall movements of freight in the MAG Region,

FIGURE 4
TOTAL FREIGHT FLOWS IN THE MAG REGION BY TYPE OF MOVEMENT



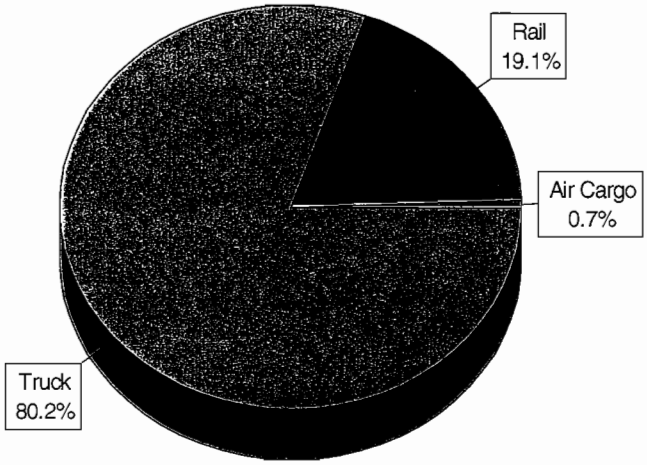
Source: Reebie Associates, Maricopa Association of Governments

FIGURE 5
TOTAL FREIGHT FLOWS INTO, OUT OF, AND WITHIN THE MAG REGION BY MODE



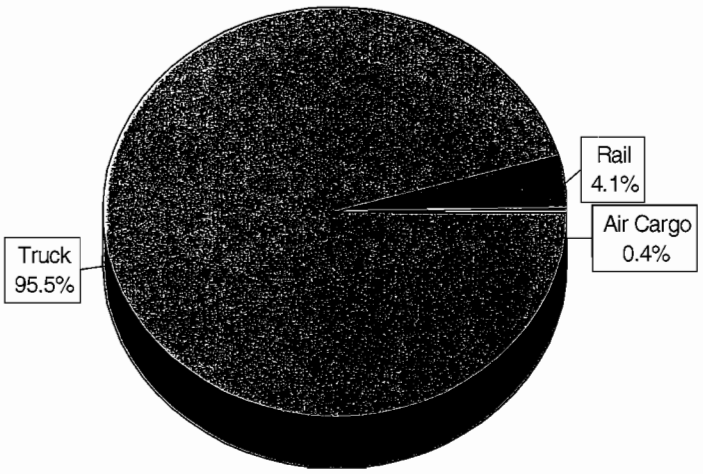
Source: Reebie Associates, Maricopa Association of Governments

FIGURE 6
TOTAL FREIGHT FLOWS BY MODE: INBOUND TO THE MAG REGION



Source: Reebie Associates, Maricopa Association of Governments

FIGURE 7
TOTAL FREIGHT FLOWS BY MODE: OUTBOUND FROM THE MAG REGION



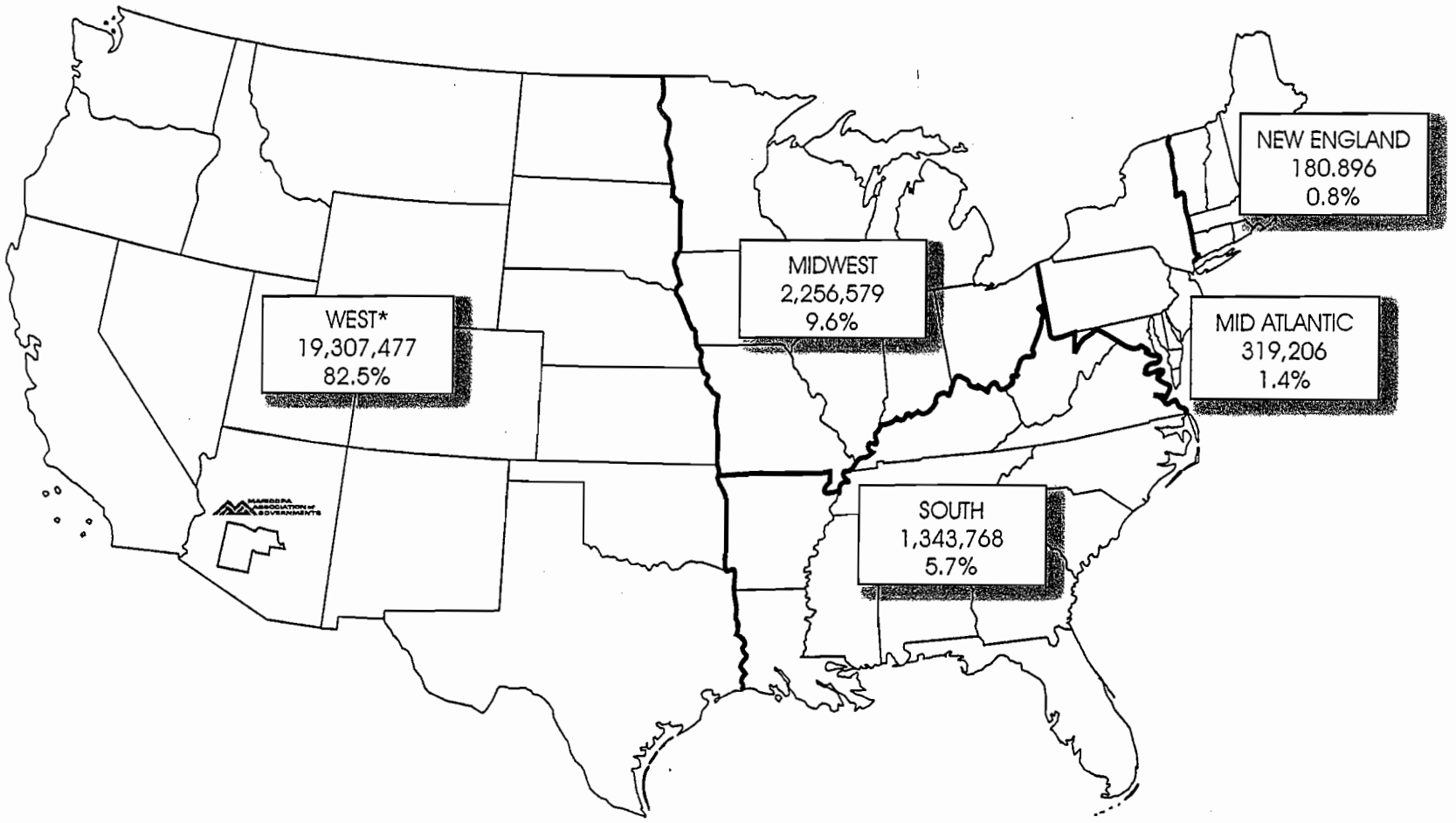
Source: Reebie Associates, Maricopa Association of Governments

these figures emphasize the overall dominance and importance that the trucking industry has on the shipping and receiving of goods.

Figures 4 through 7 provide insight into the overall flow of freight by movements and by mode. Some of the most notable observations substantiate the fact that the MAG Region receives more freight than it exports to other areas, and that the trucking industry maintains a key role in the transporting of goods into, within, and out of the region. When assessing the amount of freight that is shipped and received, it is important to identify patterns and trends associated with the movement of goods beyond the boundaries of the MAG Region, and to also have knowledge of the primary trading areas. Such information is useful for freight logistics; observing geographic markets; identifying patterns in the freight industry; for transportation planning purposes; and in some cases, determining future transportation capacity issues and identifying potential infrastructure concerns.

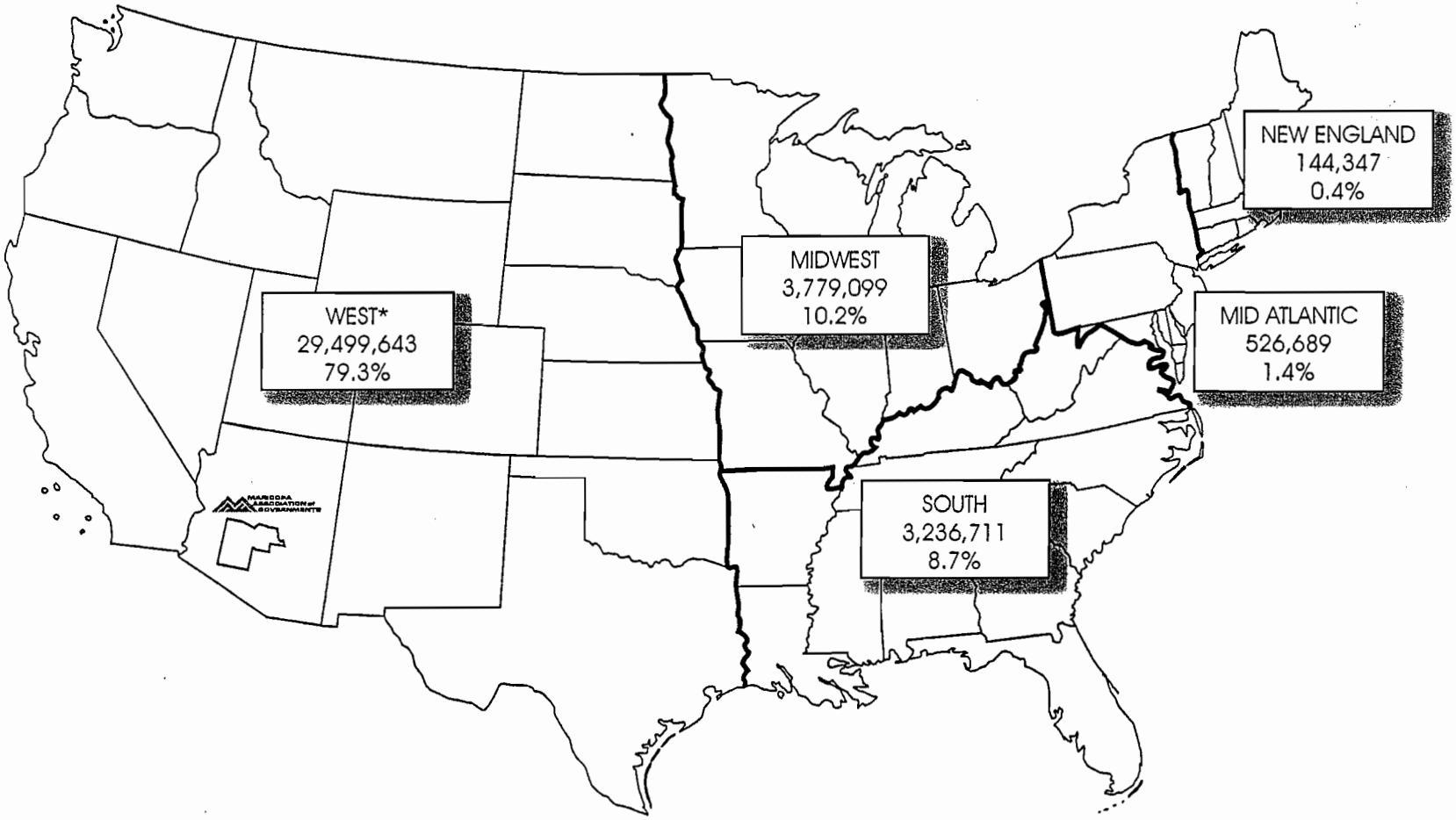
From a national perspective, Figures 8 and 9 provide information on the destinations of all outgoing freight from the MAG Region, and the origins of all incoming freight into the region. As displayed on Figure 8, the major region of all outgoing freight from the MAG Region in 2001 was the western United States. Of all outgoing freight, approximately 82.5 percent was sent to areas within the west; whereas 9.6 percent was sent to the Midwest, 5.7 percent was sent to the south, 1.4 percent was sent to the mid Atlantic, and the remaining 0.8 percent was sent to New England. Although not displayed on Figure 8, the major trading area for outgoing MAG goods consisted of the remaining 14 counties within Arizona. Approximately 41 percent of all outgoing MAG freight was sent to areas throughout Arizona.

FIGURE 8
DESTINATIONS OF OUTGOING FREIGHT FROM THE MAG REGION — NATIONAL
(By Total Tons-2001)



*INCLUDES AREAS WITHIN ARIZONA (OUTSIDE OF MARICOPA COUNTY), AND ALASKA AND HAWAII.

FIGURE 9
ORIGINS OF INCOMING FREIGHT TO THE MAG REGION — NATIONAL
(By Total Tons-2001)



*INCLUDES AREAS WITHIN ARIZONA (OUTSIDE OF MARICOPA COUNTY), AND ALASKA AND HAWAII.

TABLE 11

OUTGOING AND INCOMING FREIGHT IN THE MAG REGION
(National Totals for Destination and Origin of Freight by Region - 2001)

Outgoing Freight (Destination)			Incoming Freight (Origin)		
Region	**State**	**Total Tons**	**Region**	**State**	**Total Tons**
New England	Rhode Island	20,417	**New England**	Rhode Island	4,648
	New Hampshire	14,688		New Hampshire	11,062
	Connecticut	67,337		Connecticut	18,413
	Massachusetts	66,869		Massachusetts	41,863
	Maine	5,974		Maine	66,538
	Vermont	5,611		Vermont	1,823
		180,896			**144,347**
Midwest	Wisconsin	158,683	**Midwest**	Wisconsin	225,012
	Michigan	156,100		Michigan	104,747
	Ohio	179,837		Ohio	311,950
	Indiana	298,475		Indiana	552,190
	Illinois	873,315		Illinois	1,218,746
	Missouri	347,950		Missouri	502,115
	Minnesota	178,723		Minnesota	419,469
	Iowa	63,496		Iowa	444,870
		2,256,579			**3,779,099**
Mid-Atlantic	New Jersey	65,109	**Mid-Atlantic**	New Jersey	73,272
	Pennsylvania	112,117		Pennsylvania	233,899
	New York	103,425		New York	157,294
	Delaware	3,252		Delaware	7,522
	Washington DC	2,186		Washington DC	1,097
	Maryland	33,117		Maryland	53,605
		319,206			**526,689**
West	Arizona	9,672,646	**West**	Arizona	13,069,730
	California	3,663,008		California	6,750,388
	Nevada	2,441,995		Nevada	251,627
	New Mexico	863,663		New Mexico	1,120,590
	Utah	825,922		Utah	402,307
	Texas	931,300		Texas	2,823,638
	Colorado	299,246		Colorado	342,979
	Kansas	159,114		Kansas	1,651,665
	Oklahoma	94,125		Oklahoma	649,181
	Oregon	92,441		Oregon	749,230
	Washington	91,460		Washington	666,751
	Idaho	76,557		Idaho	559,492
	Wyoming	52,339		Wyoming	53,317
	Montana	21,050		Montana	185,702
	Nebraska	14,098		Nebraska	162,762
	South Dakota	4,330		South Dakota	34,835
	North Dakota	4,055		North Dakota	25,196
	Alaska	83		Alaska	196
	Hawaii	45		Hawaii	57
		19,307,477			**29,499,643**

(Continued)
OUTGOING AND INCOMING FREIGHT IN THE MAG REGION
(National Totals for Destination and Origin of Freight by Region)

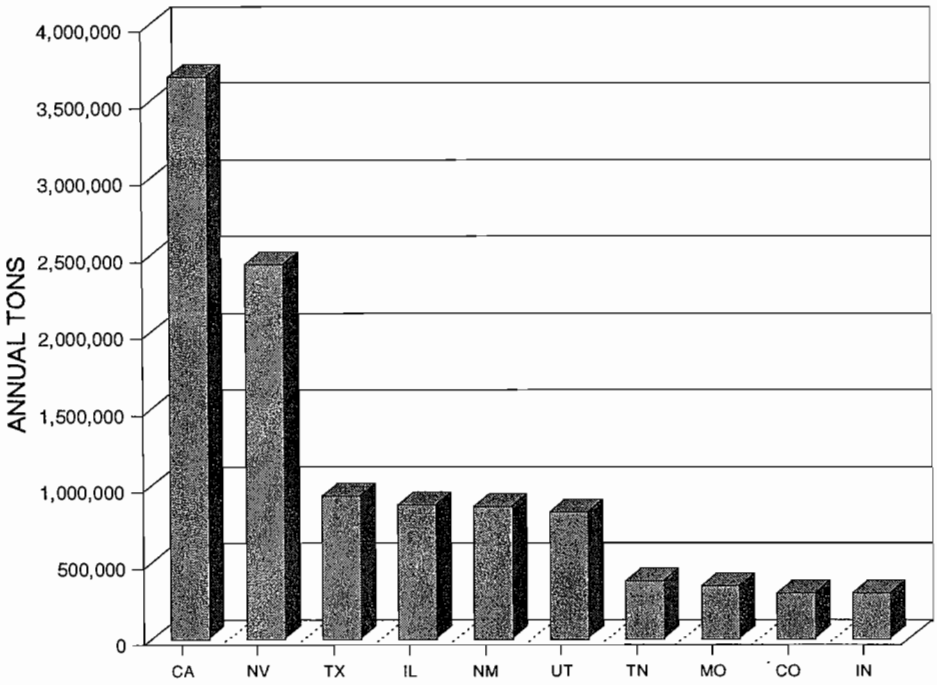
Outgoing Freight (Destination)			Incoming Freight (Origin)		
Region	**State**	**Total Tons**	**Region**	**State**	**Total Tons**
South	Georgia	272,791	**South**	Georgia	225,819
	Florida	154,091		Florida	111,680
	Tennessee	378,267		Tennessee	263,106
	Alabama	64,587		Alabama	141,727
	North Carolina	63,314		North Carolina	198,415
	Virginia	56,575		Virginia	56,284
	West Virginia	9,797		West Virginia	47,231
	Kentucky	41,267		Kentucky	91,643
	South Carolina	34,319		South Carolina	67,544
	Louisiana	84,543		Louisiana	1,129,602
	Mississippi	82,095		Mississippi	176,075
	Arkansas	102,122		Arkansas	727,585
		1,343,768			**3,236,711**
TOTAL OUTGOING		**23,407,926**	**TOTAL INCOMING**		**37,186,489**

Source: Reebie Associates, Maricopa Association of Governments - * Rounding factors may cause slight variations in figures

Figure 9 displays the origins of all incoming freight into the MAG Region. In 2001, 79.3 percent of all freight came from the western region of the United States. Of the remaining regions, 10.2 percent came from the Midwest, 8.7 percent came from the south, 1.4 percent came from the Mid-Atlantic region, and 0.4 percent of all freight came from the New England states. The major trading area for incoming goods into the MAG Region consisted of the remaining 14 counties within Arizona. Approximately 35 percent of all incoming freight was generated from areas within the state. When assessing trading areas throughout the United States in 2001, the primary trade area for the MAG Region for all incoming and outgoing freight was the State of Arizona.

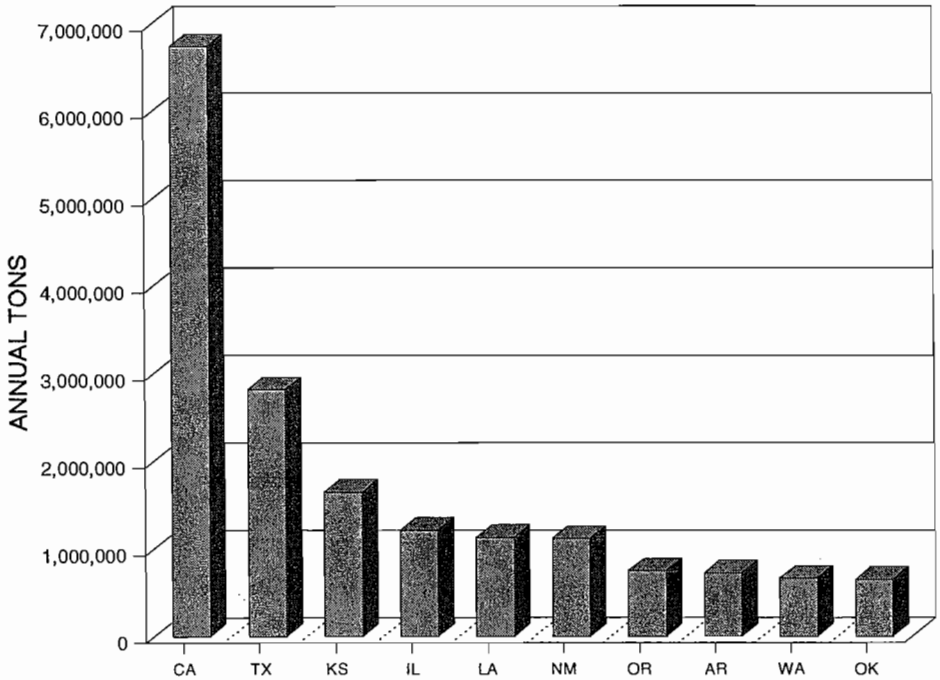
Table 11 identifies the total amount of freight in 2001 that was outgoing from, and incoming to the MAG Region. The table displays the total amount of freight by tons, and specifies the total amount of freight movements for each state by region. The information displayed in Table 11, and on Figures 8 and 9 provide a statistical overview and visual depiction of aggregate freight movements. All data is compiled and delineated into the national regions of New England, the American Midwest, the Mid-Atlantic States, the west, and the southern United States. When assessing primary trading areas, or states by their respective region, the key states of trade for the MAG Region include Massachusetts, Illinois, Pennsylvania, Arizona, and Louisiana.

FIGURE 10
OUTBOUND FREIGHT FROM THE MAG REGION: TOP 10 DESTINATION STATES



Source: Reebie Associates, Maricopa Association of Governments

FIGURE 11
INBOUND FREIGHT TO THE MAG REGION: TOP 10 ORIGIN STATES



Source: Reebie Associates, Maricopa Association of Governments

Figures 10 and 11 display the top 10 states of origin and destination outside of Arizona. When excluding freight movements that were generated and terminated within the MAG Region and the State of Arizona, the primary states for outbound freight movements include California, Nevada, Texas, Illinois and New Mexico. When considering inbound freight, the primary states of origin are California, Texas, Kansas, Illinois and Louisiana. Aside from Arizona, the primary reciprocal trading areas for the MAG Region are the States of California, New Mexico, Texas, and to a lesser extent, the states of Illinois, Utah and Nevada. Based upon the data in Table 11, the MAG Region sent more freight than it received to the region of New England. However, less freight was shipped to other regions of the country than what was received within the region. MAG received more freight from the remaining regions of the country, than the overall amount of freight that was exported to those respective regions in return. The significant factor in this data is that the majority of freight movements within the region involve inbound freight.

TABLE 12

OUTGOING AND INCOMING FREIGHT IN THE MAG REGION
(Arizona Totals for Destination and Origin of Freight by County – 2001, Truck and Air Freight Only – Rail Excluded to Protect Shipper Privacy)

Outgoing Freight (Destination)		Incoming Freight (Origin)	
County	**Total Tons**	**County**	**Total Tons**
Pima	4,345,427	Pinal	4,484,958
Pinal	1,492,698	Pima	3,722,197
Yavapai	717,470	Yavapai	1,061,088
Coconino	516,590	Coconino	892,383
Cochise	489,680	Yuma	487,181
Navajo	430,912	Graham	343,004
Mohave	401,356	Cochise	296,258
Yuma	380,052	Gila	220,496
Gila	303,089	Mohave	215,174
Apache	264,307	Navajo	183,010
Santa Cruz	104,196	Apache	99,791
Graham	77,796	Greenlee	77,443
La Paz	45,241	Santa Cruz	35,905
Greenlee	18,405	La Paz	1,103
TOTAL OUTGOING	**9,587,220**	**TOTAL INCOMING**	**12,119,991**

Source: Reebie Associates, Maricopa Association of Governments/* - Represents internal origin and destination of freight

The majority of transported goods to and from the MAG Region take place from within the State of Arizona. In 2001, 9,672,646 tons, or approximately 41.2 percent of all outgoing freight from the MAG Region was destined for the other 14 counties within Arizona, whereas the remaining 59.8 percent was sent to other regions throughout the United States. Also, 13,069,730 tons, or approximately 35.2 percent of all incoming freight originated from the other 14 counties in Arizona, whereas the remaining 64.8 percent came from other areas of the country. Table 12 provides an overview of all outgoing and incoming freight from within the State of Arizona. Also, Figures 12 and 13 graphically display each of the counties in Arizona and illustrate the levels of freight being moved from and to the MAG Region.

As displayed in Table 12, the major MAG trading partner within Arizona is Pima County, which includes the metropolitan area of Tucson. Approximately 45.3 percent of all outgoing freight within Arizona is sent to Pima County and the Greater Tucson area, and 28.5 percent of all incoming freight is received from Pima County. Throughout the state, the majority of freight shipments from the MAG Region terminate in Pima, Pinal, Yavapai and Coconino Counties. The majority of all incoming freight to the region is also generated in Pima, Pinal, Yavapai and Coconino Counties.

Table 13 displays the primary metropolitan trade partners for the MAG Region. The table displays the top 20 market areas for inbound and outbound freight. This table displays the total amount of freight that is transported by the composite modes of truck, rail and air. As displayed, the primary trading partners for the MAG Region are the cities of Tucson and Los Angeles. Other top trading partners include the cities of Flagstaff, Las Vegas and San Francisco.

Commodity Analysis

The previous section was intended to provide for an in-depth overview of where freight in the MAG Region was shipped to, and the origin of incoming freight to the region at both the state and national levels. The purpose of the following section is to provide an overview of the primary commodities that are shipped from, and received within the MAG Region. As stated, the freight flow and commodity data that is contained within this assessment was obtained from Reebie Associates, which compiled a specially designed database (MAG TRANSEARCH) that is specifically intended to analyze freight movements associated with the region.

The MAG TRANSEARCH database allows for the identification and analysis of all manufactured and non-manufactured commodities based on a Standard Transportation Commodity Classification (STCC) system. This is a comprehensive system that is used to identify the leading commodities that are shipped and received at 2 and 4 digit levels. All 2-digit STCC commodities are essentially transported goods that are broadly defined into general categories that allow for easy identification. Under the 2-digit category, information is further broken down into 4-digit STCC listings, which are very specific in their identification of the type of commodity transported. For example, a 2-digit STCC

FIGURE 12
DESTINATIONS OF OUTGOING FREIGHT FROM THE MAG REGION – ARIZONA
(By Total Tons - 2001)

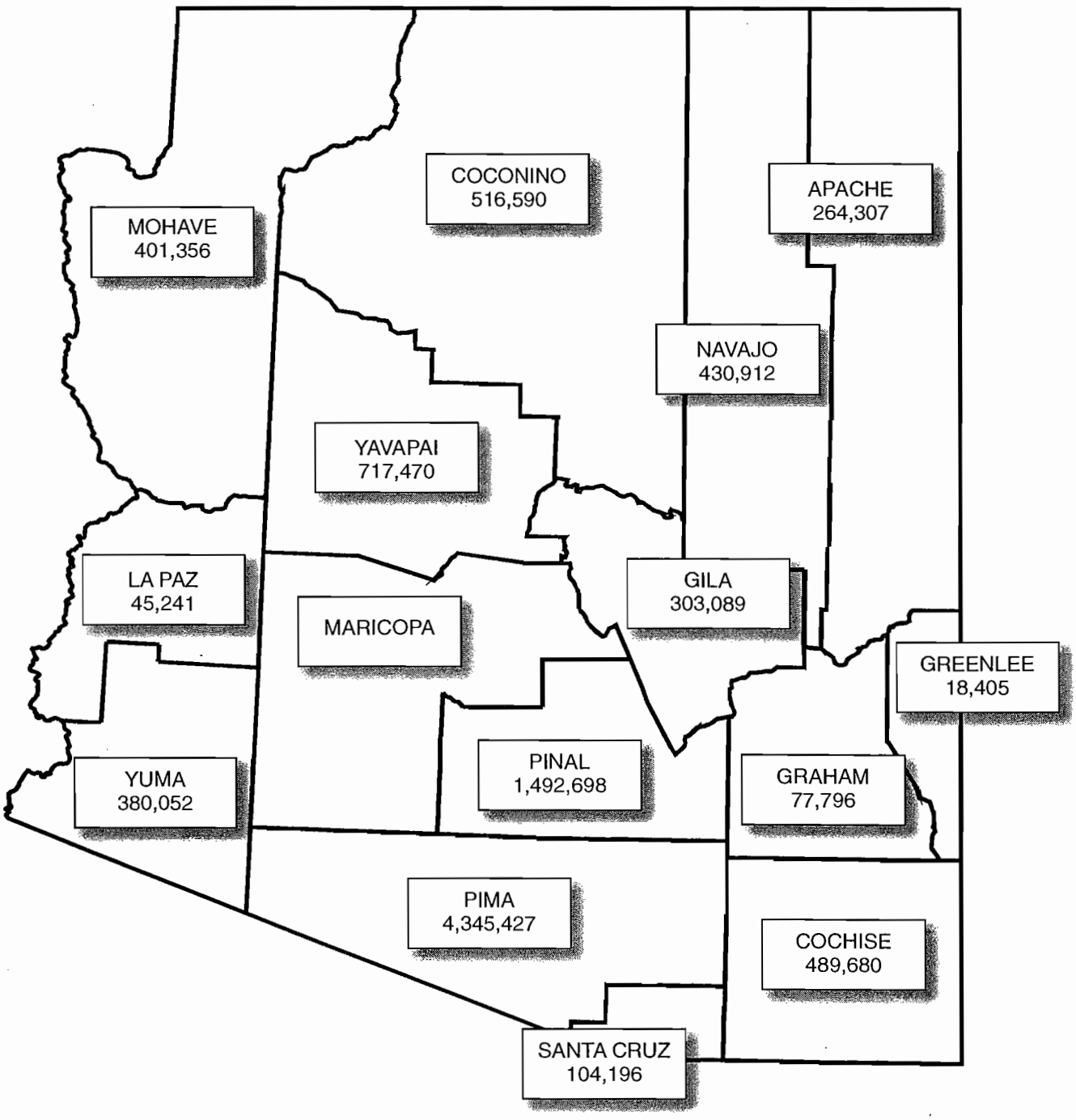


FIGURE 13
ORIGINS OF INCOMING FREIGHT
TO THE MAG REGION – ARIZONA
(By Total Tons - 2001)

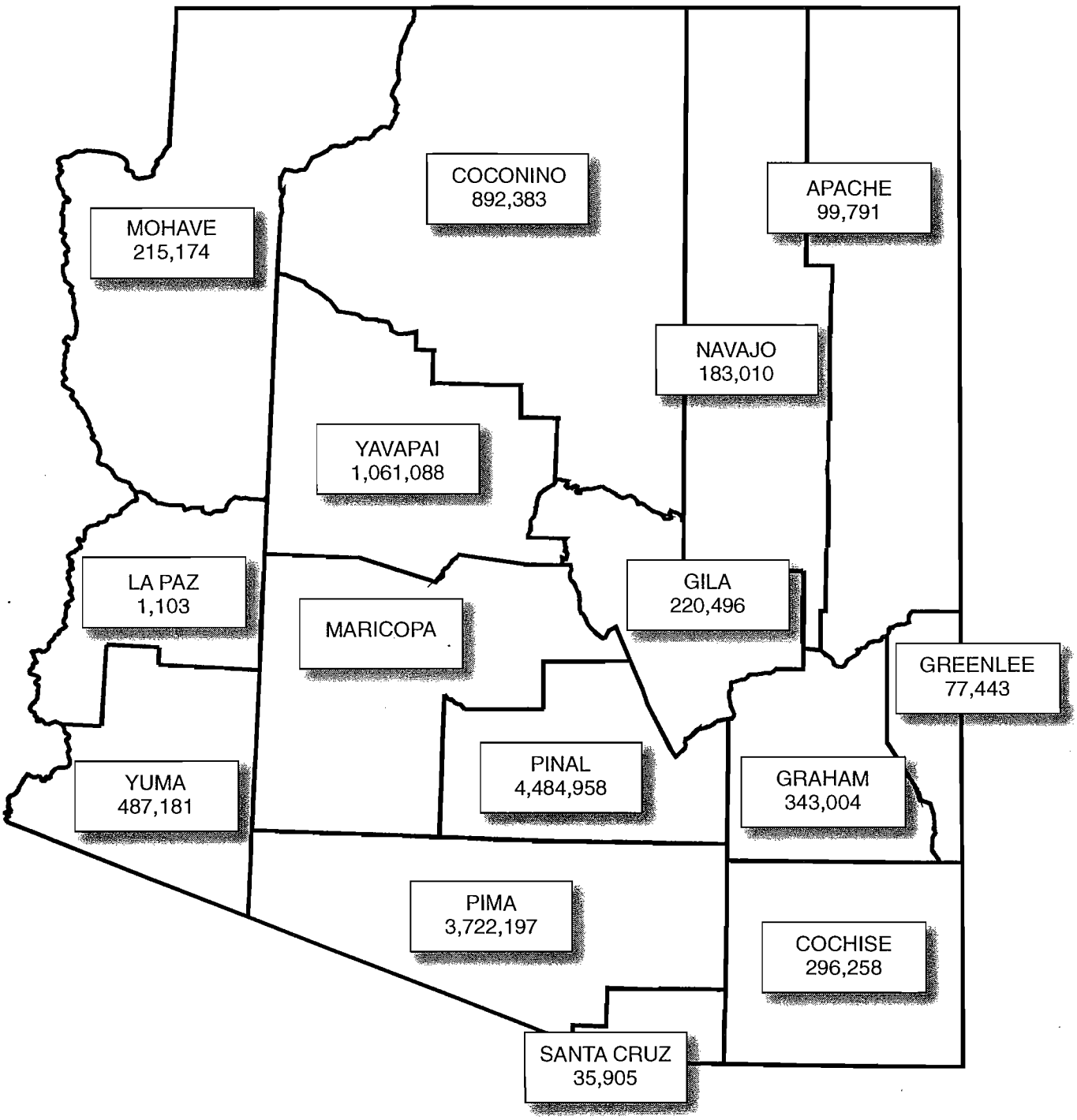


TABLE 13

TOTAL FREIGHT
PRIMARY METROPOLITAN AREAS OF TRADE
(Outbound and Inbound Goods - 2001)

Outbound Freight (Destination)			Inbound Freight (Origin)		
	Metropolitan Region	Total Tons		Metropolitan Region	Total Tons
1	Tucson, Arizona	4,968,124	1	Los Angeles, California	4,573,787
2	Los Angeles, California	2,671,552	2	Tucson, Arizona	4,050,360
3	Las Vegas, Nevada	1,882,367	3	Flagstaff, Arizona	2,332,683
4	Flagstaff, Arizona	1,704,191	4	San Francisco, California	1,652,119
5	Reno, Nevada	987,322	5	Wichita, Kansas	1,428,477
6	San Francisco, California	807,976	6	Chicago, Illinois	1,179,269
7	Salt Lake City, Utah	774,017	7	Houston, Texas	775,224
8	Albuquerque, New Mexico	762,248	8	Dallas, Texas	671,369
9	Chicago, Illinois	644,599	9	Albuquerque, New Mexico	579,157
10	St. Louis, Missouri	398,122	10	Baton Rouge, Louisiana	528,100
11	Memphis, Tennessee	333,809	11	Portland, Oregon	498,684
12	El Paso, Texas	330,238	12	Amarillo, Texas	448,178
13	Denver, Colorado	221,824	13	Tulsa, Oklahoma	360,077
14	Dallas, Texas	210,298	14	Las Vegas, Nevada	358,822
15	Houston, Texas	209,749	15	Spokane, Washington	343,971
16	New York, New York	204,208	16	Seattle, Washington	327,441
17	Atlanta, Georgia	186,800	17	Little Rock, Arkansas	321,780
18	San Diego, California	179,200	18	Eugene, Oregon	309,958
19	Minneapolis, Minnesota	168,748	19	El Paso, Texas	301,470
20	Sacramento, California	154,716	20	San Antonio, Texas	291,119

Source: Reebie Associates, Maricopa Association of Governments

may identify a general commodity category, whereas a 4-digit breakdown allows for the specific identification of goods and products that are associated with the broader 2-digit category.

Figure 14 displays the top 10 commodities that are sent from the MAG Region to all other areas. This includes shipments to other regions within the State of Arizona and to other areas of the United States. The commodities as displayed on Figure 14 are by 2-digit STCC, which lists the top 10 classifications or goods or products that are sent to areas outside of the MAG Region. Based upon this information, the primary commodity groups that are being exported from the MAG Region include food or kindred products, clay, concrete, glass or stone products; and lumber or wood products. In 2001, about 7 million tons of food or kindred products were exported out of the MAG Region; over 5 million tons of clay, concrete, glass or stone was exported, and over 3 million tons in lumber or wood products were sent to other regions.

Figure 15 displays the primary commodity groups that are transported into the MAG Region on an annual basis. This information as displayed includes all shipments from other areas of Arizona and the United States. The primary commodity classifications, or

categories of products or goods that were received into the region during 2001 include clay, concrete, glass or stone; food or kindred products; nonmetallic minerals; and lumber or wood products. In 2001, the region received a total of over 7 million tons of clay, concrete, glass or stone products; over 6 million tons in food or kindred products; and approximately 5 million tons in nonmetallic minerals.

Collectively, the top 10 STCC sectors, or categories as display in Figure 14 comprise a total of over 16 million tons of all outbound commodities. This represents approximately 70 percent of all goods sent from the region to other areas. Figure 15, which displays the top10 STCC sectors, or categories of incoming goods, represents approximately 70 percent of all goods coming into the region. Together, these figures provide an accurate depiction of the region's top incoming and outgoing commodities.

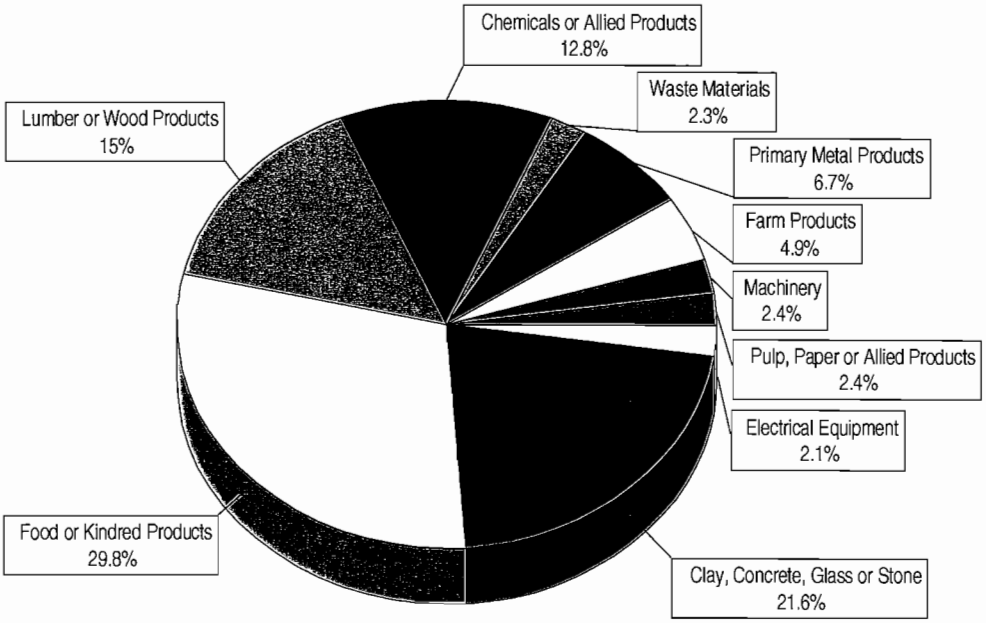
Tables 14 and 15 provide further insight into the types of commodities that are being imported and exported. This information is presented at the 4-digit STCC level, which offers the most comprehensive overview, and moves away from the broader categories by ranking "all" individual products that are subcategorized under the 2-digit classification method. By displaying the top incoming and outgoing 4-digit commodities, it allows for a more itemized list of "specific" commodities that are being shipped and received in the MAG Region. Tables 14 and 15 display the top 50 items of all outbound and inbound commodities.

Commodity Values

Tables 16 and 17 provide information on the leading inbound and outbound commodities by total value. These tables rank the top 25 commodities that are transported between the MAG Region and other areas of the country. The commodities are identified by the total tons that were transported during 2001. The total tons are calculated into pounds, which are then multiplied against a standard value per pound unit of transport in accordance with the standardized Reebie TRANSEARCH database, to reach a total value figure expressed in U.S. Dollars. The leading commodities in the tables are the total combined values resulting from all truck, rail and air cargo freight movements.

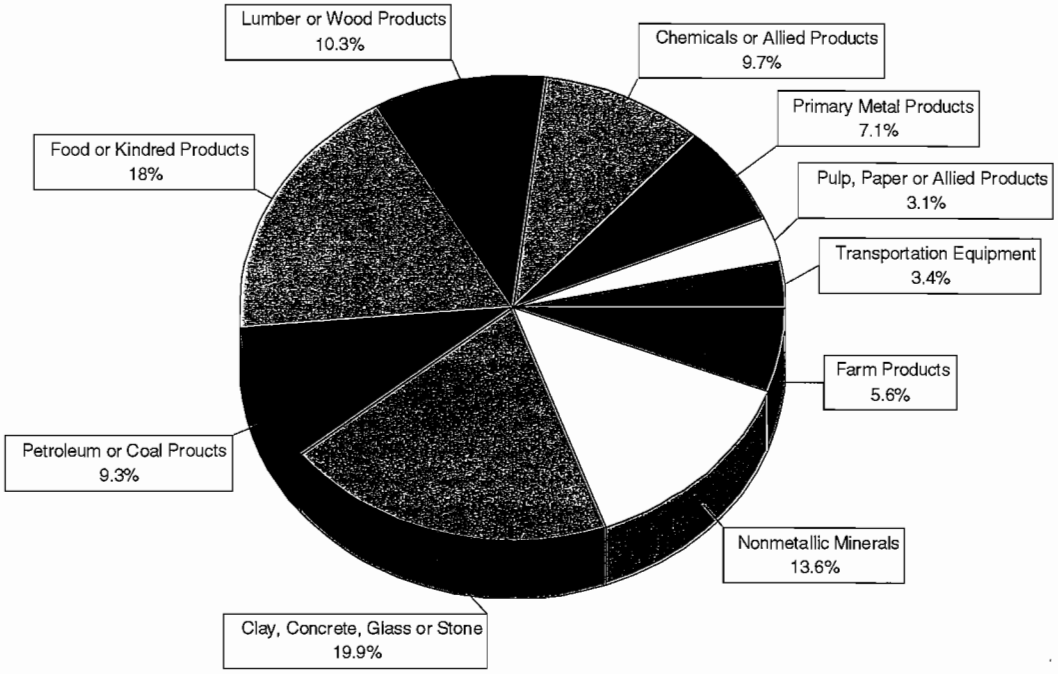
As displayed on Table 16, the leading outbound commodities were semiconductors, ordnance, internal combustion engines, electronic components and pharmaceuticals. Semiconductors were valued at a total of $10.4 Billion dollars, which represent the highest valued cargo exported from the MAG Region. As displayed on Table 17, the leading inbound commodities were electronic data processing equipment (or computers), motor vehicles, telephone and telegraph equipment, miscellaneous plastic products, and semiconductors. Electronic data processing equipment was valued at $4.4 Billion dollars, which made it the highest valued commodity import into the MAG Region during 2001.

FIGURE 14
TOP OUTBOUND COMMODITIES FROM THE MAG REGION



Source: Reebie Associates, Maricopa Association of Governments

FIGURE 15
TOP INBOUND COMMODITIES TO THE MAG REGION



Source: Reebie Associates, Maricopa Association of Governments

TABLE 14

LEADING OUTBOUND COMMODITIES FROM THE MAG REGION
(Individual Commodities By 4-Digit STCC)

	Commodity	Outbound Tons
1	Concrete	1,864,845
2	Soft Drinks or Mineral Water	1,603,041
3	Nonmetallic Minerals	996,690
4	Gypsum Products	829,654
5	Potassium or Sodium Compound	819,486
6	Primary Forest Materials	686,609
7	Primary Lead Smelter Products	680,055
8	Dog, Cat or Other Pet Food	645,849
9	Ice, Natural or Manufactured	590,189
10	Industrial Gases	565,368
11	Flour or Other Grain Mill Products	516,263
12	Portland Cement	483,089
13	Cottonseed Oil or By-products	434,638
14	Plywood or Veneer	381,828
15	Miscellaneous. Field Crops	367,280
16	Plastic Matter or Synthetic Fibers	356,461
17	Manufactured Homes	293,426
18	Metal Scraps or Tailings	216,102
19	Nonferrous Wire	204,817
20	Miscellaneous Wood Products	195,455
21	Miscellaneous Plastic Products	191,233
22	Containers or Boxes, paper	180,617
23	Miscellaneous Internal Combustion Engines	153,192
24	Animal By-Products	147,077
25	Miscellaneous Industrial organic Chemicals	140,928
26	Processed Milk	137,195
27	Millwork or Cabinetwork	123,558
28	Miscellaneous Fresh Vegetables	123,517
29	Treated Wood Products	112,027
30	Leafy Fresh Vegetables	111,846
31	Miscellaneous Sawmill or Planning Mill	111,395
32	Miscellaneous Food Preparations	109,303
33	Newspapers	107,398
34	Wood Products	104,136
35	Malt Liquors	100,144
36	Grain	93,215
37	Cut Stone or Stone Products	89,567
38	Nonmetal Minerals, Processed	89,343
39	Meat, Fresh Frozen	84,798
40	Meat, Fresh or Chilled	84,730
41	Iron or Steel Castings	82,950
42	Paper Waste or Scrap	76,380
43	Solid State Semiconductors	72,990
44	Paper Bags	69,056
45	Miscellaneous Agricultural Chemicals	68,535
46	Creamery Butter	67,401
47	Pharmaceuticals	66,291
48	Fabricated Metal Products	65,930
49	Manifold Business Forms	63,134
50	Scaffolding Equip or Ladders	61,660

Source: Reebie Associates, Maricopa Association of Governments

TABLE 15

LEADING INBOUND COMMODITIES TO THE MAG REGION
(Individual Commodities By 4-Digit STCC)

	Commodity	Inbound Tons
1	Nonmetallic Minerals	1,951,123
2	Concrete Products	1,864,845
3	Portland Cement	1,584,688
4	Petroleum Refining Products	1,286,540
5	Dairy Farm Products	1,202,274
6	Gypsum Products	922,487
7	Metallic Ores	813,541
8	Electrometallurgical Products	791,655
9	Miscellaneous Agricultural Chemicals	772,965
10	Primary Forest Materials	674,396
11	Liquefied Gases, Coal or Petroleum	656,042
12	Lumber or Dimension Stock	562,538
13	Soft Drinks or Mineral Water	559,607
14	Motor Vehicles	558,724
15	Leather Luggage or Handbags	528,988
16	Malt Liquors	528,642
17	Miscellaneous Wood Products	451,614
18	Potassium or Sodium Compound	428,020
19	Miscellaneous Plastic Products	423,224
20	Primary Metal or Steel Products	403,486
21	Asphalt Coatings or Felt	358,253
22	Plastic Matter or Synthetic Fibers	306,165
23	Meat Products	288,271
24	Miscellaneous Food Preparations	280,073
25	Plywood or Veneer	244,789
26	Paints, Lacquers, Etc.	227,865
27	Roasted or Instant Coffee	226,673
28	Paper	226,474
29	Animal By-products, Inedible	221,637
30	Nonmetal Minerals, Processed	202,683
31	Miscellaneous Coal or Petroleum Products	200,861
32	Fiber (Paper or Pulp Board)	200,381
33	Fabricated Metal Products	198,146
34	Wet Corn Milling or Milo	176,726
35	Grain	163,615
36	Biscuits, Crackers or Pretzels	156,607
37	Cut Stone or Stone Products	154,452
38	Primary Metal Products, NEC	151,192
39	Flour or Other Grain Mill Products	149,887
40	Meat, Fresh or Chilled	144,448
41	Meat, Fresh Frozen	144,265
42	Miscellaneous Sawmill or Planing Mill	141,479
43	Miscellaneous Industrial Organic Chemicals	139,755
44	Canned Fruits, Vegetables, Etc.	138,450
45	Containers or Boxes, Paper	134,204
46	Fertilizers	126,985
47	Chemical Preparations	124,316
48	Wood Products	122,322
49	Prepared or Canned Feed	121,649
50	Metal Stampings	117,061

Source: Reebie Associates, Maricopa Association of Governments

TABLE 16

TOTAL VALUE OF OUTBOUND FREIGHT FROM THE MAG REGION
(2001)

	Commodity	Outbound Tons	Total Pounds	Value Per Pound (U.S. Dollars)	Total Value (U.S. Dollars)
1	Semiconductors	72,990	145,980,000	71.647	10,459,029,060
2	Ordnance	24,416	48,832,000	43.972	2,147,240,704
3	Internal Combustion Engines	153,192	306,384,000	6.05	1,853,623,200
4	Miscellaneous Electronic Components	54,608	109,216,000	15.053	1,644,028,448
5	Pharmaceuticals	66,291	132,582,000	7.25	961,219,500
6	Radio/TV Transmitting Equipment	13,447	26,894,000	34.894	938,439,236
7	Manufactured Homes	293,426	586,852,000	1.396	819,245,392
8	Nonferrous Wire	204,817	409,634,000	1.987	813,942,758
9	Soft Drinks or Mineral Water	1,603,041	3,206,082,000	0.237	759,841,434
10	Mechanical Measuring/Control Equip.	15,165	30,330,000	22.658	687,217,140
11	Miscellaneous Plastic Products	191,233	382,466,000	1.735	663,578,510
12	Telephones and Telegraph Equipment	20,090	40,180,000	16.029	644,045,220
13	Plastic Matter or Synthetic Fibers	356,461	712,922,000	0.765	545,385,330
14	Cork Products/Floor Tiles	58,256	116,512,000	4.638	540,382,656
15	Industrial Pumps	38,930	77,860,000	6.565	511,150,900
16	Metalworking Machinery	32,142	64,284,000	7.845	504,307,980
17	Woodenware or Flatware	58,936	117,872,000	4.188	493,647,936
18	Women or Girl's Clothing	27,809	55,618,000	8.854	492,441,772
19	Primary Lead Smelter Products	680,055	1,360,110,000	0.351	477,398,610
20	Steam Engines and Turbines	14,430	28,860,000	16.535	477,200,100
21	Miscellaneous Printed Matter	54,655	109,310,000	4.287	468,611,970
22	Millwork or Cabinetwork	123,558	247,116,000	1.716	424,051,056
23	Newspapers	107,398	214,796,000	1.939	416,489,444
24	Miscellaneous Machinery or Parts	38,727	77,454,000	5.17	400,437,180
25	Sewing Machines or Parts	12,683	25,366,000	12.913	327,551,158

Source: Reebie Associates, Maricopa Association of Governments

TABLE 17

TOTAL VALUE OF INBOUND FREIGHT FROM THE MAG REGION
(2001)

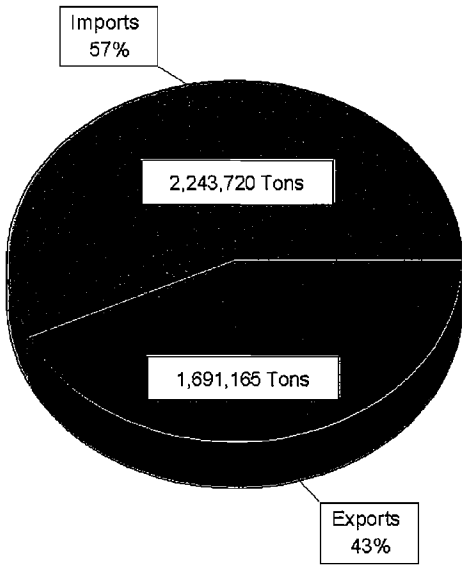
	Commodity	Inbound Tons	Total Pounds	Value Per Pound (U.S. Dollars)	Total Value (U.S. Dollars)
1	Electronic Data Processing Equipment	108,977	217,954,000	20.400	4,446,261,600
2	Motor Vehicles	558,774	1,117,548,000	3.423	3,825,366,804
3	Telephones and Telegraph Equipment	62,571	125,502,000	16.029	2,011,671,558
4	Miscellaneous Plastic Products	423,224	846,448,000	1.730	1,464,355,040
5	Semiconductors	8,846	17,692,000	71.647	1,267,578,724
6	Missile or Space Vehicle Parts	5,706	11,412,000	109.525	1,249,899,300
7	Primary Iron or Steel Products	428,020	856,040,000	1.391	1,190,751,640
8	Aircraft	8,283	16,566,000	70.319	1,164,904,554
9	Electro Metallurgical Products	791,655	1,583,310,000	0.706	1,117,816,860
10	Miscellaneous Agricultural Chemicals	772,965	1,545,930,000	0.675	1,043,502,750
11	Meat Products	288,271	576,542,000	1.713	987,616,446
12	Miscellaneous Printed Matter	105,601	211,202,000	4.287	905,422,974
13	Signs or Advertising Displays	80,569	161,138,000	5.430	874,979,340
14	Men's or Boy's Clothing	49,256	98,512,000	8.550	842,277,600
15	Coffee	226,673	453,346,000	1.845	836,423,370
16	Wallpaper	112,414	224,828,000	3.673	825,793,244
17	Boats	112,685	225,370,000	3.572	805,021,640
18	Optical Instruments or Lenses	16,521	33,042,000	22.831	754,381,902
19	Women or Girl's Clothing	42,381	84,762,000	8.854	750,482,748
20	Aircraft or Missile Engines	6,324	12,648,000	54.492	689,214,816
21	Paint Products	227,865	455,730,000	1.313	598,373,490
22	Miscellaneous Machinery or Parts	55,681	111,362,000	5.17	575,741,540
23	Sporting or Athletic Goods	83,931	167,862,000	3.304	554,616,048
24	Cork Products/Floor Tiles	59,108	118,216,000	4.638	548,285,808
25	Miscellaneous Manufacturing Products	42,209	84,418,000	6.257	528,203,426

Source: Reebie Associates, Maricopa Association of Governments

Trade with Mexico

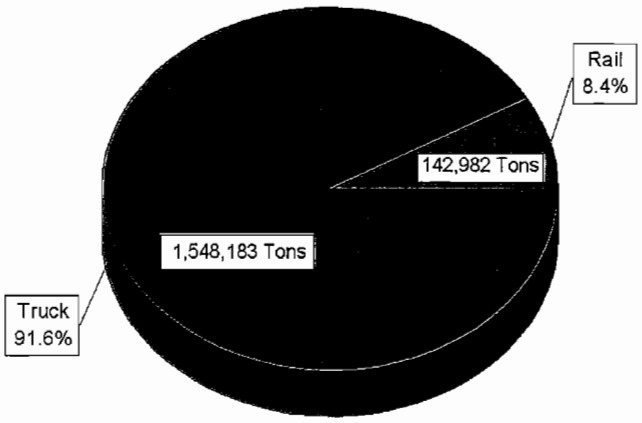
Since the passage of NAFTA in 1994, an important element of the local freight transportation industry involves the region's ongoing role in active trade with the Nation of Mexico. In an effort to provide further insight into Mexican trade, Reebie Associates created a separate database to display the overall characteristics of northbound (imported) and southbound (exported) freight movements between Mexico and the MAG Region. This particular data provides a statistical overview for the truck and rail modes. At present, air cargo transport between the MAG Region and Mexico is very minimal, and accurate data for current freight shipments has not been compiled.

FIGURE 16
TRADE WITH MEXICO



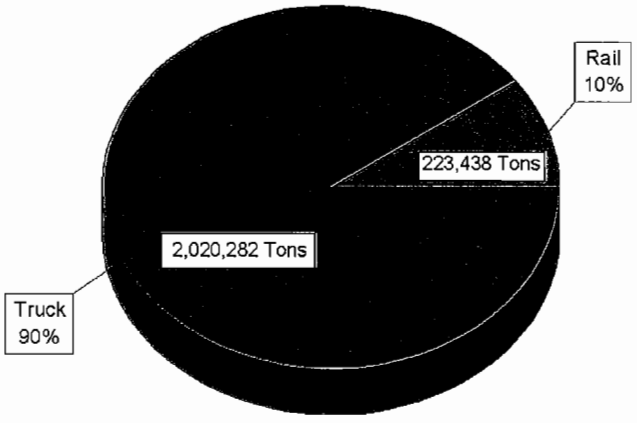
Source: Reebie Associates, Maricopa Association of Governments

FIGURE 17
FREIGHT FLOWS FROM THE MAG REGION TO MEXICO (EXPORTS) BY TYPE OF MOVEMENT



Source: Reebie Associates, Maricopa Association of Governments

FIGURE 18
FREIGHT FLOWS FROM MEXICO TO THE MAG REGION (IMPORTS) BY TYPE OF MOVEMENT



Source: Reebie Associates, Maricopa Association of Governments

According to information displayed on Figure 16, in 2001 approximately 57 percent of all freight movements between the MAG Region and Mexico consisted of incoming imports coming into the MAG Region, whereas 43 percent of all goods movements were exports to Mexico. Figure 17 displays all southbound (exports) freight flows from the MAG Region to the Nation of Mexico. In 2001, the trucking industry hauled 91.6 percent of all outgoing goods to Mexico, and the remaining 8.4 percent of goods were hauled by rail. Figure 18 displays all northbound (imports) freight flows from Mexico to the MAG Region. In 2001, 90 percent of all northbound freight was hauled by truck, whereas 10 percent entered the region through rail.

Tables 16 and 17 display the primary outbound and inbound commodities during 2001. This information is displayed at the 3-digit STCC level, which is the most comprehensive Mexican trade data available from Reebie Associates. According to these tables, the primary commodities that are exported to Mexico are essentially field crops, plastic and metal products, petroleum products, and construction materials. The primary Mexican commodities that are imported to the MAG Region consist of agricultural products, motor vehicles and associated components, and construction-related materials.

TABLE 18

LEADING SOUTHBOUND COMMODITIES TO MEXICO (EXPORTS)
(Individual Commodities By 3-Digit STCC)

	Commodity	Outbound Tons
1	Field Crops	378,845
2	Plastic Matter or Synthetic Fibers	306,213
3	Miscellaneous Plastic Products	120,801
4	Miscellaneous Primary Metal Products	56,337
5	Miscellaneous Wood Products	54,180
6	Fresh Fruits or Tree Nuts	48,134
7	Petroleum	47,648
8	Steel Mill Products	46,387
9	Portland Cement	41,196
10	Nonferrous Metal Basic Shapes	40,275
11	Millwork or Prefabricated Wood Products	38,031
12	Concrete, Gypsum, or Plaster	33,879
13	Industrial Electrical Equipment	29,304
14	Miscellaneous Electrical Machinery	29,020
15	Paper	28,595
16	Meat or Poultry (Fresh or Chilled)	27,016
17	Miscellaneous Food Preparations	26,556
18	Agricultural Chemicals	25,034
19	Fresh Vegetables	25,017
20	Cutlery, Hand Tools or Hardware	19,853

Source: Reebie Associates, Maricopa Association of Governments

TABLE 19

LEADING NORTHBOUND COMMODITIES TO THE MAG REGION (IMPORTS)
(Individual Commodities By 3-Digit STCC)

	Commodity	Outbound Tons
1	Fresh Vegetables	422,272
2	Field Crops	379,356
3	Industrial Chemicals	271,618
4	Fresh Fruits or Tree Nuts	229,291
5	Canned or Preserved Food	169,864
6	Portland Cement	139,150
7	Nonferrous Primary Smelter Productions	122,595
8	Motor Vehicles or Related Equipment	99,729
9	Nonferrous Metal Basic Shapes	62,596
10	Engines or Turbines	36,257
11	Livestock or Livestock Production	34,920
12	Fresh Fish or Marine Products	21,101
13	Miscellaneous Farm Products	19,131
14	Construction Machinery or Equipment	15,268
15	Agricultural Chemicals	13,831
16	Miscellaneous Food Preparations	12,106
17	General Industrial Machinery	11,374
18	Concrete, Gypsum, or Plaster	11,126
19	Sawmill or Planing Mill Products	9,717
20	Industrial Electrical Equipment	8,795

Source: Reebie Associates, Maricopa Association of Governments

Chapter Footnotes

1. U.S. Department of Transportation, Federal Highway Administration, Office of Planning and Environment, *Quick Response Freight Manual*, Chapter 2, February 1996.

CHAPTER FIVE

TRUCKING

The purpose of this chapter is to provide an overview of the trucking freight mode, and to address the role of trucking and the trucking industry within the goods movement process. Presently, the freight transportation industry in the MAG Region primarily involves the movement of goods by truck, rail, air, and to a lesser extent, the movement of commodities through pipelines. Of these modes, it is the trucking industry that is responsible for transporting the majority of freight to, from, within and throughout the MAG Region.

As previously displayed in Figure 1 of this document, the U.S. Department of Transportation, Federal Highway Administration, reported that approximately 66.4 percent of all freight shipments in 2002 were transported by truck. This level is expected to continue in the future, and was substantiated by a recent report of the American Trucking Association, entitled *U.S. Freight Transportation Forecast to 2014*, which concluded that trucking will continue to dominate the domestic freight market in the U.S. over the next 10 years. This report estimates that the trucking industry will account for approximately 68.2 percent of all freight movements throughout the country. Also, according to recent statistics compiled by Reebie Associates in 2001, approximately 85.6 percent of all commodity movements in the MAG Region are conducted through the use of a truck.

While there may be innovations in other modal segments of the freight transportation industry, the overall role of trucking in the goods movement process will continue to be extremely vital. The remaining sections of this chapter will provide an overview of the trucking industry, and will address major employers, regional truck terminals and facilities, information on commodity flows and truck markets, commodity values, trade with Mexico, and regional mobility issues.

OVERVIEW OF THE TRUCKING INDUSTRY

Trucks are responsible for moving the bulk share of freight to, from, within and throughout our region's cities and towns, and their ability to operate in an efficient environment is crucial to maintaining the regional economy. The trucking industry in the MAG Region is extremely diverse, and ranges from smaller companies that maintain a single truck, or a limited number of trucks, to much larger trucking operations which

actively maintain hundreds of vehicles and employ thousands of people. Trucking companies maintain an important role in local economies by providing for the necessary ground-based transportation of goods, and in many cases, needed services or ancillary uses such as the movement of waste products. From a broader perspective, the trucking industry is responsible for bringing in raw materials and processed goods for manufacturing; distributing goods to warehouses and retail locations; and delivering goods to businesses and consumers.

Trucking Legislation

Historically, at a national level, the U.S. Government has maintained an active role in the operations of the trucking industry and has also implemented a number of provisions, which have ranged from overall vehicle design to providing regulatory oversight and enforcement activities. Some of the earliest, significant government interventions into the trucking industry can be traced back to 1935, when Congress passed the Motor Carrier Act. This particular legislation expanded the role of the Interstate Commerce Commission (ICC) in an effort to regulate commerce between the states, which affected pricing controls and a number of safety issues surrounding the trucking industry. With the passing of the Federal-Aid Highway Act of 1956, the construction of a national highway system increased the viability of trucks as a primary carrier of goods. The trucking industry expanded considerably during this time period. However, the ICC continued to oversee the controls enacted in 1935 until the United States Department of Transportation was created, and initiated operations in 1967.

In 1980, the trucking industry was partially deregulated, which nullified many of the governmental provisions that were initially enacted during the 1930s. The final deregulation of the trucking industry was completed with the passing of federal legislation in the mid-1990s. During the 1980s and 1990s, the deregulation process allowed for the establishment of many smaller, independent trucking companies, which essentially stimulated competition in the industry and lowered industry transport costs. Today, there are very few laws or regulations at the state or federal levels that control economic activities of the trucking industry. Aside from deregulation, in 1994 Congress enacted NAFTA, which removed restrictions, eliminated tariffs and opened up the borders between the U.S., Mexico and Canada to allow for free trade.

Types of Firms and Services

Aside from being the most dominant mode of freight transport, the trucking industry has very specialized elements, and serves many different facets of the goods movement process at the international, national, regional and local levels. Trucking varies by the size of a company and the types of services that each company provides to a particular market. Domestic trucking services in the U.S. are generally divided into local, regional, or long distance, and can also be segmented into either a truckload (TL) or Less-Than-Truckload (LTL) category. Companies that haul complete containers are considered TL

carriers, whereas carriers that specialize in partial loads are considered LTL carriers. Industry specialization can involve specific transport services for customers in local, regional or long distance markets, and can be initiated by companies that are either privately owned, or operate on a for-hire basis for customers in need of various freight services. Trucking operations may involve a variety of different methods or transport, such as goods hauled by dry van, or tanker; or could involve companies that haul general cargo, opposed to more specialized cargoes that could include refrigeration, moving services, special liquids or flammable cargoes, or waste products and hazardous materials.

Within the U.S., large corporations that maintain private fleets currently comprise the major share of the trucking industry. Some of these corporations may specialize in TL or LTL movements; consist of specialty services; or serve as drayage carriers, which are trucking firms that concentrate their business on shorter trips, and may often provide service to intermodal freight operations within the region. Local drayage firms may focus their activities between road and rail operations, or provide freight transportation services to parent companies or facilities requiring minimal distances of travel.

In terms of diversity, many private or "in house" firms may transport full containers to a variety of markets and customers, whereas others may concentrate on LTL activities, or manage complex networks of consolidation, logistical transport operations, and distribution facilities. Other corporations may in fact concentrate their efforts on small package shipments and deliveries through multiple centers and locations, such as FedEx and the United Parcel Service (UPS). As previously stated, some companies may specialize in specific cargo areas such as the transport of liquids, the movement of furniture, the movement of refrigerated goods, transporting hazardous materials, or ensuring the movement of high-value goods that may be time sensitive. Private carriers typically involve trucking fleets that are operated by larger corporations, such as grocery chains, retail chains, or other major service, manufacturing or industrial companies. Private carriers essentially manage and operate their own fleets in an effort to coordinate manufacturing or business processes, which allows them to provide better and effective service to their customer base. Although not always the case, the majority of freight shipments conducted by private carriers are less than 100 miles in distance.

Aside from private carriers, for-hire trucking companies are primarily in business to provide freight transportation services or logistical services to a variety of customers for a fee. For-hire companies include national companies such as Swift Transportation, Schneider National, J.B. Hunt, Roadway Services, and Knight Transportation, and take on a variety of different roles in the freight transportation industry. They can function as comrnon carriers, which means that they are available to any company or customer, or they can function as contract carriers, meaning that they establish contracts with specific clients and agree to provide services for a period of time. For-hire carriers typically offer both TL and LTL services, and maintain average freight shipment distances that are typically much further than average distances traveled by private carriers. It is not uncommon for this sector of the industry to transport goods over distances of 500 miles.

According to the U.S. Department of Transportation, Federal Highway Administration (FHA), of the 353 billion miles traveled by trucks in 1994, 57 percent of all miles were generated by vehicles weighing less than 10,000 pounds. Trucks weighing between 10,001 and 33,000 pounds accounted for another 15 percent of total miles. Medium to large combinations, such as tractor-trailers, weighing 33,000 pounds or more generated about 28 percent. [1]

In their report, entitled *US Freight: Economy in Motion*, the U.S. Department of Transportation indicates that the type of carrier can often be affected by distance. For freight trips of less than 100 miles, it is typically private carriers that are providing the competition. When considering trips of over 100 miles, it is usually the for-hire motor carriers that are providing the competition – and the only exception to this concept is for freight loads that are between 30,000 and 60,000 pounds moving between 100 to 200 miles. In this particular distance scenario, private trucking is often the carrier of choice. [2]

According to the *1997 Economic Census*, which was conducted by the U.S. Department of Commerce, the majority of commercial trucks conducting operations within the State of Arizona were owned and operated by smaller companies which maintain relatively small commercial vehicle fleets. Approximately 400,000 trucks in the state were owned and operated by companies maintaining commercial fleets of less than 10 trucks. In 1997, approximately 36,000 trucks in the state were assigned to larger commercial fleets, which were owned by carriers that maintained fleets of over 100 trucks. This represented a 46.7 percent increase from 1992 to 1997. Over the decade of the 1990s, there has been an overall increase in the number of trucks that were assigned to larger commercial fleets, and a slight decline in single truck operators. This signifies that many trucking companies within the State are becoming larger operation-based carriers, which may have a tendency to be affiliated with a larger corporate environment.

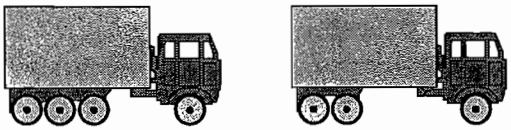
Vehicles and Equipment

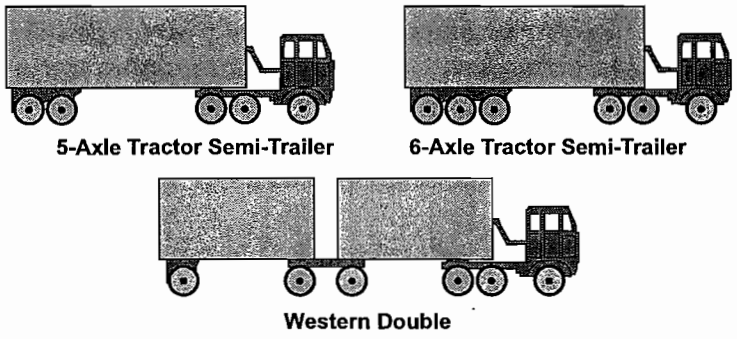
When considering the types of trucks that transport goods, there are a variety of different methods and container arrangements that are utilized by trucking companies. The type of truck used depends on the type of freight being moved; the weight of the cargo; the arrangement of transport; time factors; permitting, weight and route restrictions; the location and facility arrangement; transport costs and pricing considerations, and a number of other operational, logistical or transport factors. In the trucking industry, the type of trucks or vehicle configurations for transporting freight can be categorized into one of the following three sectors: single unit trucks; conventional combination vehicles; and longer combination vehicles (LCVs), which contain multiple trailers.

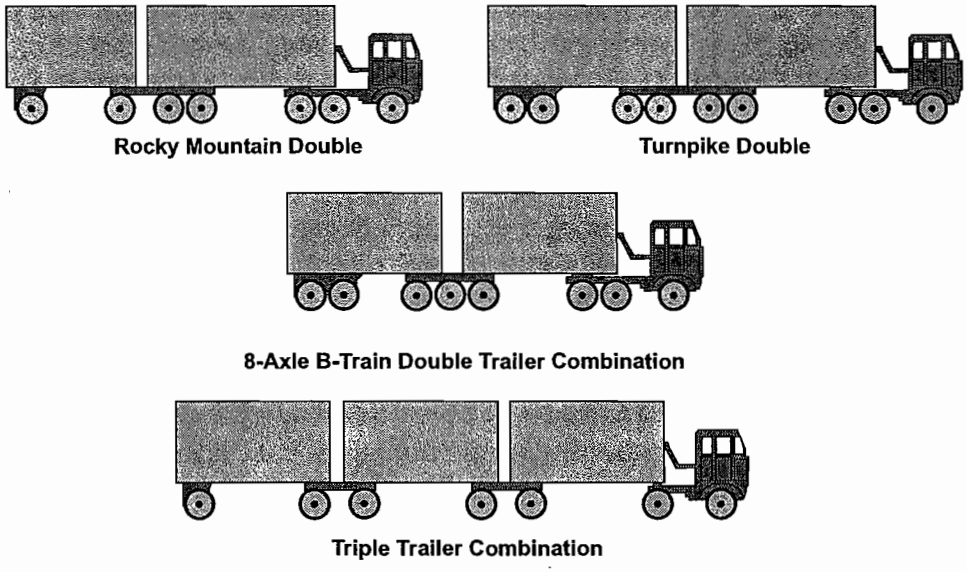
Single Unit Trucks have attached containers, and are often referred to as straight trucks, because they do not contain a separate tractor and trailer for the hauling of

FIGURE 19

TRUCK CONFIGURATIONS







Source: U.S. Department of Transportation

freight. Typically, such trucks are less than 24 feet in length and are often used for shorter hauls, or specialized deliveries. The most common method of transporting goods in the trucking industry is through the use of a conventional tractor semi-trailer. Semi-trailers are known as conventional combination vehicles, and consist of a tractor and a trailer which is pulled behind the vehicle. The smallest semi-trailers utilized for the transportation of freight are 28 feet in length, and are referred to as "pups."

However, the most common trailer sizes within the trucking industry are 45 and 48 feet in length, and are the primary form of tractor semi-trailer transport. Although not as prevalent, the trucking industry has also witnessed the emergence of 53-foot trailers over the past several years. The utilization of 53-foot trailers is becoming more common in the industry, especially among some of the larger carriers.

When hauling goods, there are a number of ways in which a tractor semi-trailer can be configured to maximize efficiency, or to meet the specific transport needs of shippers and receivers. As displayed in Figure 19, single unit, or straight trucks; conventional combination vehicles; and longer combination vehicles represent three methods of attaching trailers to tractors for the purposes of moving freight. Configurations can take on a variety of arrangements.

Single trucks consist of 3 to 4 axles, and generally are not longer than 24 feet in length. When considering conventional combination vehicles, Figure 19 displays traditional 5 and 6 axle tractor semi-trailers, and what is commonly referred to in the industry as "western doubles." These are primarily smaller trailers that are connected in tandem. Longer Combination Vehicles (LCV) can consist of Rocky Mountain Doubles, Turnpike Doubles, 8 Axle B Train Double Trailer Combinations, and Triple Trailer Combinations. Aside from dump trucks, garbage trucks, larger vans, and specialized hauling vehicles, all truck transport for freight is generally conducted utilizing one of the configurations as displayed in Figure 19. However, in addition to the displayed trailers, another form of transport that is becoming popular in the trucking industry involves the movement of containers. For maritime and international trade, standard containers are mostly 20 and 40 feet in length, and are commonly shipped via rail. However, within the trucking industry, some companies are utilizing intermodal containers consisting of 45, 48 and 53-foot units. While not common, 53-foot units are generally limited to high-density trade lanes throughout various areas of the country.

In addition to the size of various truck configurations that are utilized for the movement of goods, the U.S. Government also maintains federal laws for truck sizes and weight requirements. During the 1950s, the Federal Government implemented a series of maximum truck axle, gross weight, and width requirements for trucks utilizing the national Interstate System. Over the 1970s and 1980s the Government implemented a number of additional changes and new requirements. Today, the Federal requirements in the U.S. for trucks involve the following limits: a maximum of 20,000 pounds for single axles; a maximum of 34,000 pounds for tandem axles; a maximum of 80,000 pounds for gross vehicle weight; a maximum vehicle width of 8 ½ feet; 48 feet (minimum) in length for semi-trailers in a semi-trailer combination; and 28 feet for trailers in a double-trailer

combination. Also, in 1984 the Federal Highway Administration made an administrative decision which authorized states to issue permits for container movements at weight levels that exceed the maximum Federal law of 80,000 pounds. This change did not affect the existing maximum weight of 80,000 pounds for truck movements. [3]

As reported by the Bureau of the Census, Table 20 displays the reported average length of trucks within the State of Arizona between the years of 1992 and 1997. This data indicates the categorical changes in the total number of trucks by length during 1992 and 1997, and excludes all pickups, panel trucks, vans, sports utility vehicles and station wagons, which are often utilized for non-commercial purposes. According to the Bureau of the Census, the primary gains over the 5 year period occurred for trucks over 45 feet in length, which are specifically tractor semi-trailer vehicles. This trend, along with the fact that there was a 46.7 percent increase in trucks belonging to major fleets, shows that there has been a gradual shift in Arizona's commercial vehicle truck fleet toward the tractor semi-trailer sector.

TABLE 20

COMMERCIAL TRUCK SIZES IN ARIZONA
REPORTED AVERAGES 1992-1997
(Excluding pickups, panels, vans, sports utility vehicles, and station wagons)

Total Length (In Feet)	Number of Trucks (1992)	Number of Trucks (1997)	Overall % Change
Less than 20.0	14,800	22,400	51.4
20.0 to 27.9	14,800	19,600	32.4
28.0 to 35.9	6,600	8,100	22.7
36.0 to 40.9	1,800	2,600	44.4
41.0 to 44.9	1,200	1,300	8.3
45.0 or more	10,000	17,300	73.0

Source: Bureau of the Census: *Economic Census, Vehicle Inventory and Use Survey*, 1992 and 1997

This section has addressed general regulatory items; various market specializations; carrier segmentation; weight and distance factors; and vehicle types and configurations that are related to the trucking industry in general. The following sections will provide information on the primary trucking companies and terminals in the MAG Region, and provide an overview of trucking freight flows and commodity information affiliated with the trucking industry.

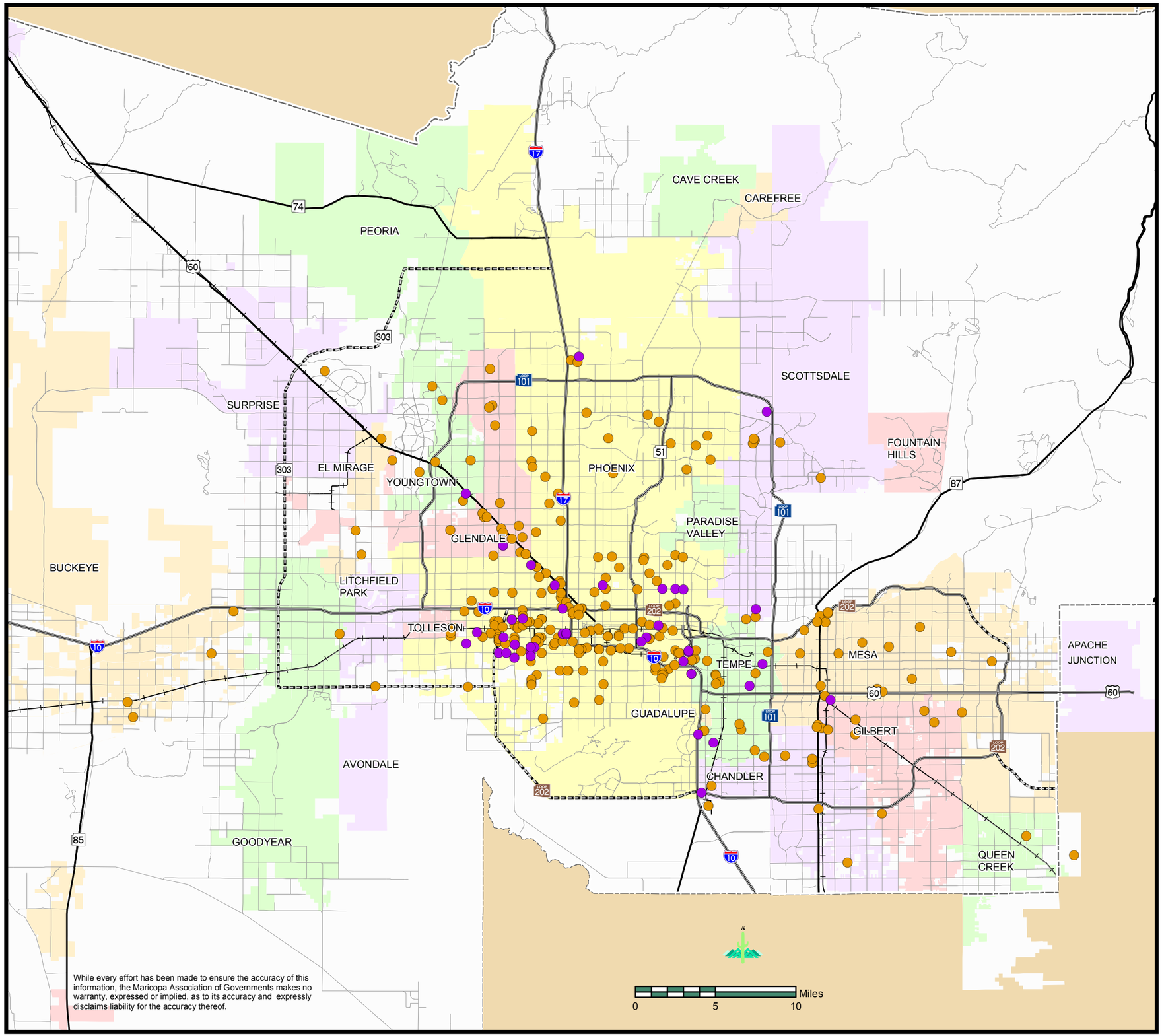
TRUCK FREIGHT AND FACILITIES

Map 10, entitled *Truck Freight and Facilities*, provides a graphic display of all active freight terminals and trucking companies located within the immediate, metropolitan area of the MAG Region. Freight terminals were addressed in Chapter Three of this

MAG Regional Freight Assessment

Map 10

TRUCK FREIGHT FACILITIES



- Freight Terminals
- Trucking Companies
- Existing Freeway
- Planned Freeway
- U.S. and State Highway
- Other Roads
- Railroad

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document, and are essentially defined as any establishment that is engaged in the operation of facilities involving the handling and transfer of freight by trucks and freight carrying vehicles, and also provide maintenance and service for motor vehicles. Truck terminals involve the handling and transfer of freight as part of the goods movement process, and provide services to both larger and smaller trucks.

Based upon the MAG 2000 Employer Database, there were a total of 43 significant terminals located throughout the region. Approximately 74 percent of all trucking terminal operations located in the MAG Region are located in the City of Phoenix. Although the locations of these particular terminals are provided on Map 10, composite information on their total size, services and specific functions to the overall trucking industry is not available.

In addition to the 43 identified terminals on Map 10, the region's intermodal facilities represent yet another significant component of the freight transportation industry. Intermodal facilities in the MAG Region were identified in Chapter Three, and are displayed in Table 4. Also, each of the identified Intermodal facilities in the region are displayed on Map 3.

An Intermodal Freight Facility is essentially situated at a location that connects different modes of transportation, and specializes in the transfer of freight from one mode to another at facilities such as terminals and airports. With the exception of air cargo services, which are often time-sensitive, the utilization of Intermodal services is more desirable than hauling goods by "all-highway movements" via the use of a truck. This is primarily due to the fact that intermodal services are less expensive, because in many cases, it is more cost effective to move trailers and containers by rail, as opposed to hauling them long distances by truck.

The previous chapters of this document placed an emphasis on non-intermodal facilities such as warehouses, manufacturing and commercial locations, concentrated areas of freight activity, and regional job centers. While these topics are all very important aspects of freight generating activities, and account for the majority of truck freight movements in the MAG Region - intermodal facilities, or terminals, are also essential components of the freight transportation industry. The majority of intermodal movements of freight within the MAG Region consist of a combination of a line haul movement by rail, and local highway movements by truck (referred to as drayage). Other significant movements also occur at regional air cargo facilities.

As displayed in Table 4 of this document, there are currently a total of 11 functional intermodal facilities located throughout the MAG Region. What is significant about the nature of each facility is the fact that the transfer of goods at each location entirely depends on truck transport. In 2001, approximately 15 percent of all inbound and outbound rail freight was intermodal. Based upon intermodal freight data, a minimum of 1.2 million tons of inbound and outbound intermodal freight was transported solely by truck. In addition, the trucking industry is responsible for the movement of freight to and from the region's identified air cargo intermodal facilities, which will be addressed in

more detail in Chapter Seven.

TRUCK ROUTES

At the regional level, the freeway system allows for the rapid and free flowing movement of goods through the provision of a limited access network. This system is designed to allow for a variety of travel options, and integrates with the regional arterial system to allow for enhanced regional mobility. Due to the developed, regional grid pattern of north-south and east-west roads, the existing arterial system allows for a higher degree of accessibility for trucks that are in the process of hauling goods to, from, within and throughout local municipalities or the region.

Certain communities have attempted to identify and promote municipal roads as designated truck routes. The purpose of providing for municipally designated truck routes is to designate a network of local routes that not only accommodates the needs of local businesses, but also upholds the local health, safety and welfare of the populace by providing for the separation of truck traffic and enhancing the local environment. Within the MAG Region, there are a total of 11 municipalities that have officially designated truck routes within their respective municipalities. Table 21 provides a list of communities that maintain current, designated truck routes for the purpose of enhancing local truck movements.

MAJOR TRUCKING EMPLOYERS WITHIN THE REGION

According to the MAG 2000 Employer Database, there are over 140 companies based within the MAG Region that are engaged in local, regional, national, and international trucking activities. Table 22 identifies the major employers within the MAG Region that employed over 100 people in 2000. This data identifies the name of the company, the city in which the business site is located, and the number of employees at each location. The information in Table 22 also includes companies that maintain multiple sites in the region, but actively employ a minimum of 100 people at each location.

TRUCKING AND FREIGHT TRANSORT IN THE MAG REGION

When considering the combined truck, rail, and air cargo freight modes in the region in 2001, over 85.6 percent of total freight flows into, out of, and within the MAG Region took place by the use of a truck. A total of 78.0 percent of all inbound freight was received through truck transport. Also, 94.2 percent of all goods that were sent out of the region were shipped through the use of a truck.

As noted earlier in this chapter, trucking activities may either be conducted by private or for-hire carriers. Private carriers are typically associated with corporations or companies that maintain their own trucking fleets. An example of a private carrier in the

TABLE 21

DESIGNATED TRUCK ROUTES WITHIN THE MAG REGION
(By Municipality)

MUNICPALITY	DESIGNATED TRUCK ROUTE
City of Apache Junction	• Meridian Road • Ironwood Drive • Idaho Road • Tomahawk Road • Goldfield Road • University Drive • Broadway Road • Apache Trail • Southern Avenue • Old West Highway (From Apache Trail to US 60) • US 60 (Superstition Freeway)
Town of Carefree	• Tom Darlington Drive (From Scottsdale City Limits to Cave Creek Road) • Cave Creek Road • Pima Road (From Cave Creek Road to Stagecoach Pass) • Cave Creek Road (From Carefree Highway to Cave Creek Town Limits)
Town of Fountain Hills	• Palisades Boulevard • Technology Drive (From 100 feet north of Saguaro Boulevard to Shea Boulevard) • Saguaro Boulevard (From Fountain Hills Boulevard to 600 feet southwest of Firebrick Drive) • Laser Drive (From Technology Drive to Leo Drive) • Grande Boulevard (From east Town Limits to Saguaro Boulevard) • Fountain Hills Boulevard (From Saguaro Boulevard to northern Town Limits)
City of Goodyear	• Dysart Road (From McDowell Road to Van Buren Street) • Litchfield Road (From McDowell Road to Maricopa County Route 85) • Estrella Parkway (From McDowell Road to Maricopa County Route 85) • Cotton Lane/Loop 303 (From Camelback Road to Maricopa County Route 85) • McDowell Road (From Cotton Lane to Litchfield Road) • Maricopa County Route 85 (From Dysart Road to Citrus Road) • Interstate 10 • Jackrabbit Road/Tuthill Road (From Maricopa County Route 85 to Rainbow Valley Road)
City of Litchfield Park	• Litchfield Road • Dysart Road
Town of Paradise Valley	• Tatum Boulevard • Lincoln Drive

(Continued)	
MUNICPALITY	**DESIGNATED TRUCK ROUTE**
City of Peoria	• Lake Pleasant Parkway
City of Phoenix	• Grand Avenue (From the west City Limits to I-17) • I-17 (From the north City Limits to I-10) • I-10 (From I-17 to 48th Street) • Grant-Lincoln Traffic way (From 7th Street to I-17) • Buckeye Road (From 19th Avenue to west City Limits) • Washington Street (From 16th Street to east City Limits) • Jefferson Street (From 16th Street to 26th Street) • 16th Street (From Washington Street to I-10) • 19th Avenue (from Grant-Lincoln Traffic Way to I-10)
City of Scottsdale	• Scottsdale Road • Hayden Road • Pima Road • Frank Lloyd Wright Boulevard • Shea Boulevard • Indian Bend Road • Camelback Road (From west City Limits to Scottsdale Road) • Thomas Road • McDowell Road • McKellips Road
City of Surprise	• Bell Road • Grand Avenue • Dysart Road • Cotton Lane
Town of Queen Creek	• Power Road • Ellsworth Road • Vineyard Road • Germann Road • Riggs Road

MAG Region is a corporation such as Coca-Cola Bottling, which maintains its own fleet of trucks and makes its own scheduled pick-ups and deliveries to an array of locations. Other examples would include corporations such as United Parcel Service or Federal Express. Unlike private carriers, for-hire carriers enter into contracts with a variety of clients, and do not specialize in the manufacturing or processing of any particular service or commodity for distribution or consumption purposes. These types of companies are essentially known as common carriers, or contract carriers, and offer both TL and LTL services to their respective clientele base. Examples of For-hire

TABLE 22

MAJOR MAG TRUCKING AND TERMINAL FACILITIES
(Individual Sites Employing over 100 Persons)

Name of Company	City	Number of Employees
United Parcel Service	Phoenix	1,561
Swift Transportation Company, Inc.	Phoenix	907
Phoenix Coca-Cola Bottling Company	Phoenix	715
United Parcel Service	Tempe	650
LSG Inc.	Phoenix	480
FedEx Ground	Phoenix	275
Federal Express Corporation	Tempe	235
Chromalloy Gas Turbine Corporation	Phoenix	228
Roadway Express, Inc.	Phoenix	225
Knight Transportation Corporation	Phoenix	207
Con-Way Western Express, Inc.	Phoenix	206
Ruan Transport Corporation	Phoenix	200
Federal Express Corporation	Phoenix	190
Viking Freight System Corporation	Phoenix	182
WestEx, Inc.	Phoenix	165
USF Bestway Transportation	Phoenix	158
Federal Express Corporation	Phoenix	150
M & P Transport, Inc.	Phoenix	150
Viking Freight System Corporation	Phoenix	150
McKelvey Trucking Company	Tolleson	147
Federal Express Corporation	Scottsdale	127
Yellow Freight Systems	Phoenix	127
Federal Express Corporation	Phoenix	125
Valley Transportation & Warehouse Inc	Phoenix	125
FedEx Ground	Phoenix	121
Central Freightlines, Inc.	Phoenix	120
Federal Express Corporation	Phoenix	118
Canyon State Courier	Tempe	114
Jaguar Fast Freight Incorporated	Phoenix	110
Dircks Moving Service	Phoenix	105
Otto Trucking Incorporated	Mesa	105
WestEx, Inc.	Phoenix	105
Consolidated Freightways Motor freight	Phoenix	100
UST Delivery Systems	Phoenix	100

Source: Maricopa Association of Governments

companies include Swift, Knight Transportation, Schneider National, J.B. Hunt or Roadway Services.

As displayed by Table 23, in 2001 59.2 percent of all outbound truck freight was shipped to other destinations by for-hire truckload (TL); whereas 38.8 percent of all truck freight consisted of private truck movements, and only 2.0 percent consisted of for-hire LTL carriers (reported LTL movements as displayed by Table 21 consist of individual loads that are less than 10,000 pounds).

TABLE 23

TRUCK MOVEMENTS IN THE MAG REGION
(By Type of Carrier – 2001)

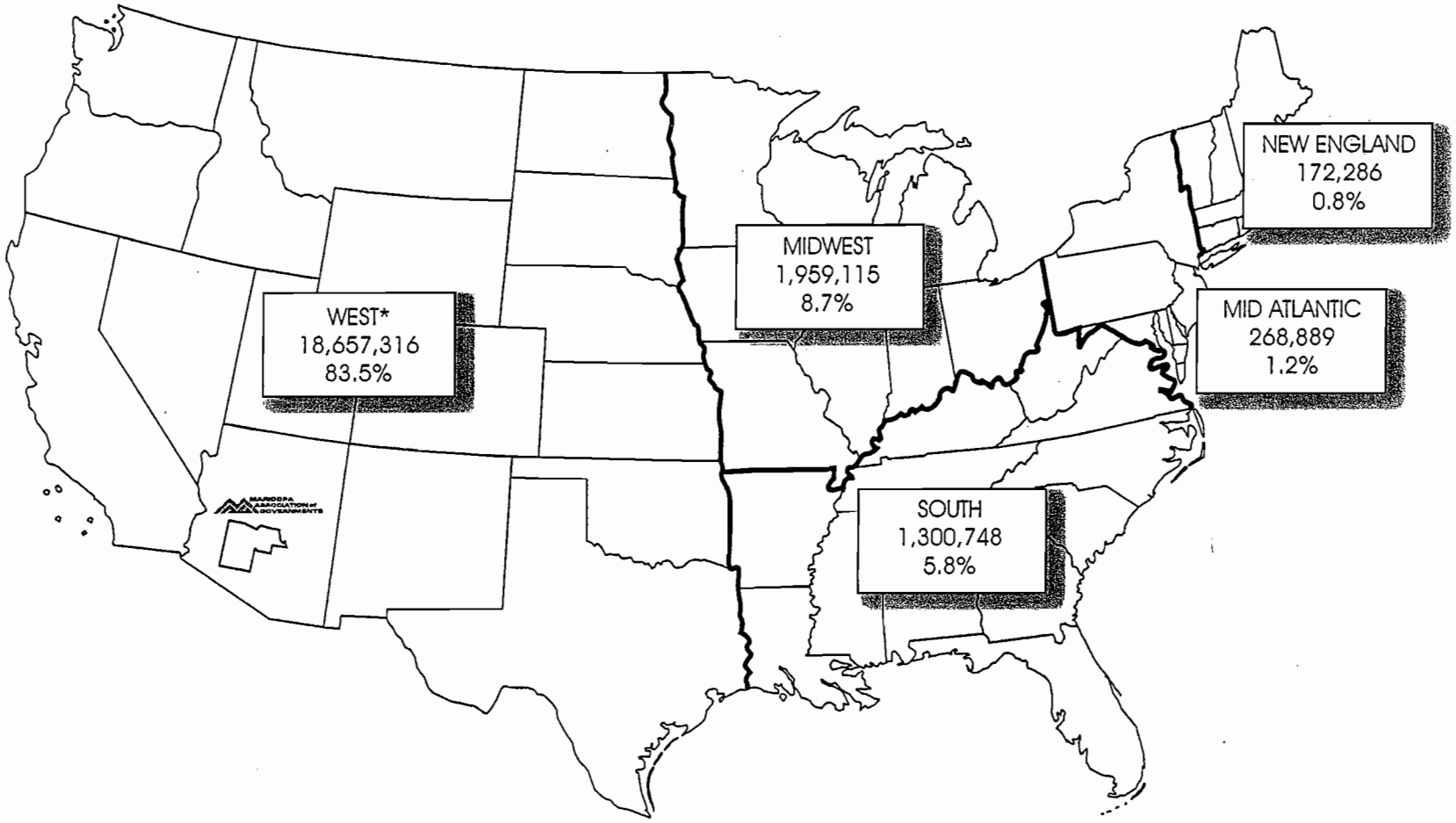
OUTBOUND TRUCK FREIGHT		
Type of Movement	**Total Tons**	**Percent**
For-Hire Truckload (TL)	13,229,233	59.2
For-Hire Less Than Truckload (LTL)	462,467	2.0
Private Truck	8,680,446	38.8
Total	22,358,354	100.0
INBOUND TRUCK FREIGHT		
Type of Movement	**Total Tons**	**Percent**
For-Hire Truckload (TL)	19,043,830	63.8
For-Hire Less Than Truckload (LTL)	1,219,640	4.0
Private Truck	9,579,964	32.1
Total	29,821,982	100.0

Source: Reebie Associates, Maricopa Association of Governments

In 2001, 63.9 percent of all inbound freight into the MAG Region consisted of movements by for-hire TL carriers; 32.0 percent of all loads were delivered by private truck; and the remaining 4.0 percent used LTL carriers. As displayed in Table 23, the dominant form of truck transport within the MAG Region's trucking industry took place by either private truck carrier or by for-hire trucks containing full truckloads (TL). For-hire carriers that carried LTL freight in 2001 accounted for a very small percentage of truck movements to and from the MAG Region. Specific TL and LTL data for private carriers in the trucking industry is not available.

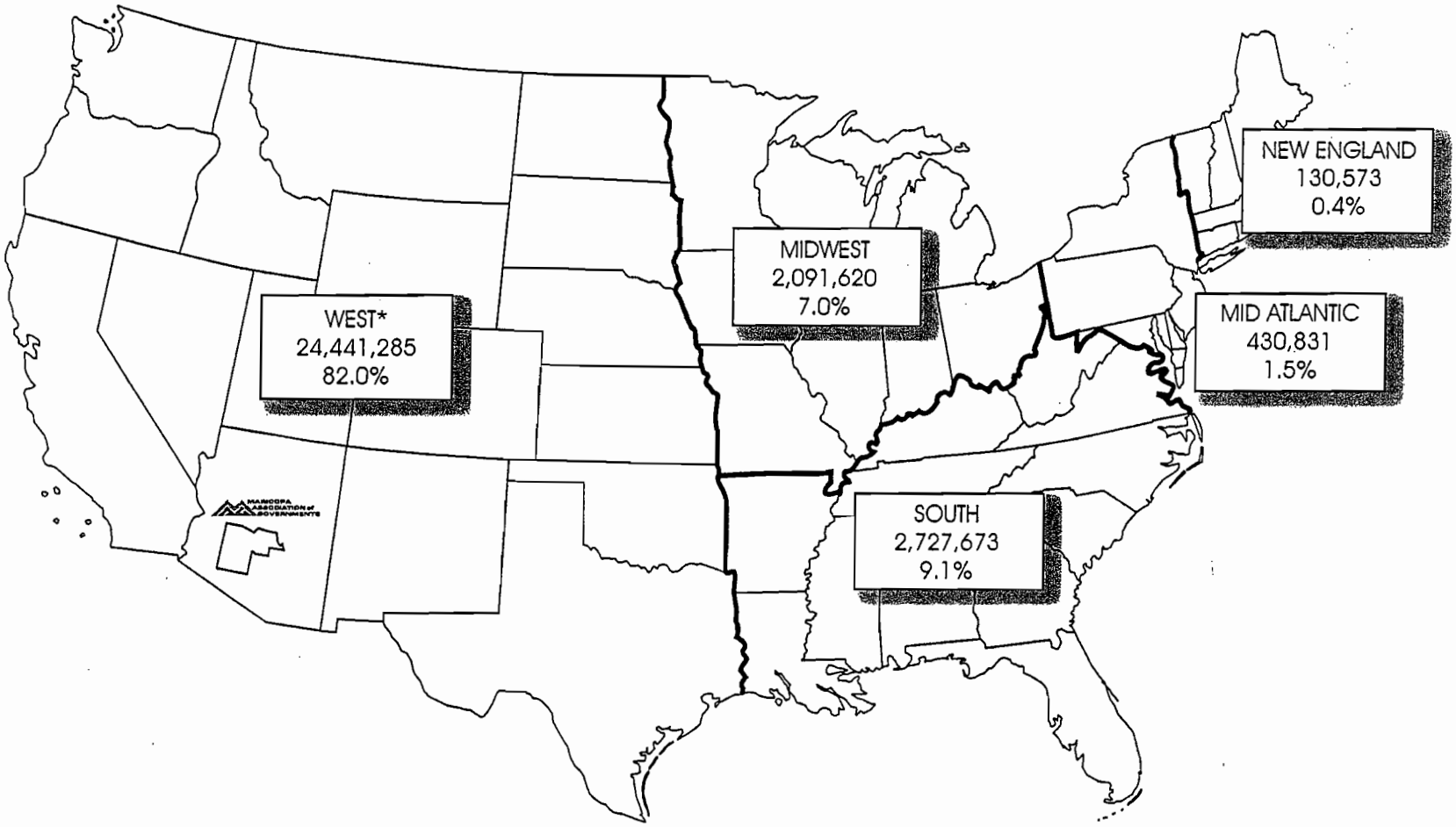
Figures 20 and 21 provide an overview of the destination of outgoing freight flows by truck from the MAG Region, and the origins of incoming truck freight from regions outside of Maricopa County. As displayed on Figure 20, approximately 83.5 percent of

FIGURE 20
DESTINATIONS OF OUTGOING TRUCK FREIGHT FROM THE MAG REGION — NATIONAL
(By Total Tons-2001)



*INCLUDES AREAS WITHIN ARIZONA (OUTSIDE OF MARICOPA COUNTY), AND ALASKA AND HAWAII.

FIGURE 21
ORIGINS OF INCOMING TRUCK FREIGHT TO THE MAG REGION — NATIONAL
(By Total Tons-2001)



*INCLUDES AREAS WITHIN ARIZONA (OUTSIDE OF MARICOPA COUNTY), AND ALASKA AND HAWAII.

all outgoing truck freight was sent to areas throughout the West; 8.7 percent was sent to the Midwest; 5.8 percent was sent to the South; 1.2 percent was sent to the Mid-Atlantic States; and the remaining 0.8 percent of all truck freight was destined for the New England states. Approximately 42.9 percent of all outbound truck freight from the MAG Region is destined for other counties within the State of Arizona.

Figure 21 displays the origins of all inbound freight into the MAG Region from other regions of the country. In 2001, approximately 82.0 percent of inbound freight originated from the West; 9.1 percent originated from the South; 7.0 percent originated from the Midwest; 1.5 percent originated from the Mid-Atlantic; and the remaining 0.4 percent originated from the New England states. The inbound freight from other regions of the country represents 59.4 percent of the total inbound freight for the MAG Region, while 40.6 percent of all inbound freight originated from the other 14 counties located within the State of Arizona.

Table 24 identifies the total amount of truck freight that was outgoing from, and incoming to the MAG Region in 2001. The information in the table displays the total tons of outbound and inbound truck freight by region. As displayed on Figures 20 and 21, and Table 24, the key states of trade for the MAG Region (outside of Arizona) include California, Texas, Nevada, New Mexico, Louisiana, Illinois and Indiana.

Figures 22 and 23 display the top 10 states of origin and destination outside of Arizona. The primary states (in order) for outbound truck freight are California, Nevada, New Mexico, Utah and Texas. The primary states of origin (in order) for inbound truck freight are California, Texas, Kansas, Louisiana, and New Mexico. Outside of the Arizona trade area, the primary trading partner for all inbound and outbound truck movements is the State of California.

In 2001, the MAG Region shipped more freight out of the region through the truck transport mode than it received. According to Table 24, a total of 22,358,354 tons of freight were sent from the region to other areas of Arizona and the United States, whereas a total of 29,821,982 tons were received from other areas throughout Arizona and the United States.

When assessing truck freight movements associated with the MAG Region, the majority of transported goods are sent to, and received from the other 14 counties within the State of Arizona. In 2001, 9,585,940 tons, or approximately 42.9 percent of all outgoing truck freight from the MAG Region was destined to the other counties within Arizona, whereas the remaining 57.1 percent of truck freight was destined for other regions throughout the United States. Also in 2001, 12,115,027 tons, or approximately 40.6 percent of all incoming truck freight originated from the other counties of Arizona, whereas the remaining 59.4 percent of freight came from other areas of the country. Table 25 provides an overview of all outbound and inbound freight to each of the counties located within Arizona. This data is displayed by total incoming and outgoing tons of truck freight, and consists of comprehensive load information obtained from private carriers, and TL and LTL for-hire carriers.

TABLE 24

OUTGOING AND INCOMING TRUCK FREIGHT IN THE MAG REGION
(National Totals for Destination and Origin of Truck Freight by Region - 2001)

Outgoing Freight (Destination)			Incoming Freight (Origin)		
Region	**State**	**Total Tons**	**Region**	**State**	**Total Tons**
New England	Rhode Island	20,377	**New England**	Rhode Island	4,324
	New Hampshire	14,688		New Hampshire	10,804
	Connecticut	66,973		Connecticut	15,156
	Massachusetts	59,602		Massachusetts	34,784
	Maine	5,035		Maine	63,682
	Vermont	5,611		Vermont	1,823
		172,286			**130,573**
Midwest	Wisconsin	156,602	**Midwest**	Wisconsin	168,778
	Michigan	152,990		Michigan	91,384
	Ohio	175,518		Ohio	249,160
	Indiana	292,277		Indiana	431,864
	Illinois	619,378		Illinois	368,621
	Missouri	328,147		Missouri	210,968
	Minnesota	171,964		Minnesota	330,323
	Iowa	62,239		Iowa	240,522
		1,959,115			**2,091,620**
Mid-Atlantic	New Jersey	36,318	**Mid-Atlantic**	New Jersey	149,044
	Pennsylvania	96,044		Pennsylvania	172,997
	New York	99,791		New York	54,781
	Delaware	3,252		Delaware	45,389
	Washington DC	2,186		Washington DC	7,522
	Maryland	31,299		Maryland	1,097
		268,889			**430,831**
West	Arizona	9,585,940	**West**	Arizona	12,115,027
	California	3,454,386		California	5,346,583
	Nevada	2,431,457		Nevada	241,598
	New Mexico	817,723		New Mexico	809,705
	Utah	796,953		Utah	277,718
	Texas	772,726		Texas	1,943,130
	Colorado	255,102		Colorado	256,962
	Kansas	133,071		Kansas	1,472,814
	Oklahoma	84,669		Oklahoma	548,174
	Oregon	70,872		Oregon	386,539
	Washington	83,824		Washington	397,537
	Idaho	75,809		Idaho	409,682
	Wyoming	52,339		Wyoming	41,406
	Montana	21,050		Montana	79,096
	Nebraska	13,011		Nebraska	67,419
	South Dakota	4,330		South Dakota	34,835
	North Dakota	4,055		North Dakota	13,060
	Alaska	0		Alaska	0
	Hawaii	0		Hawaii	0
		18,657,316			**24,441,285**

(Continued)

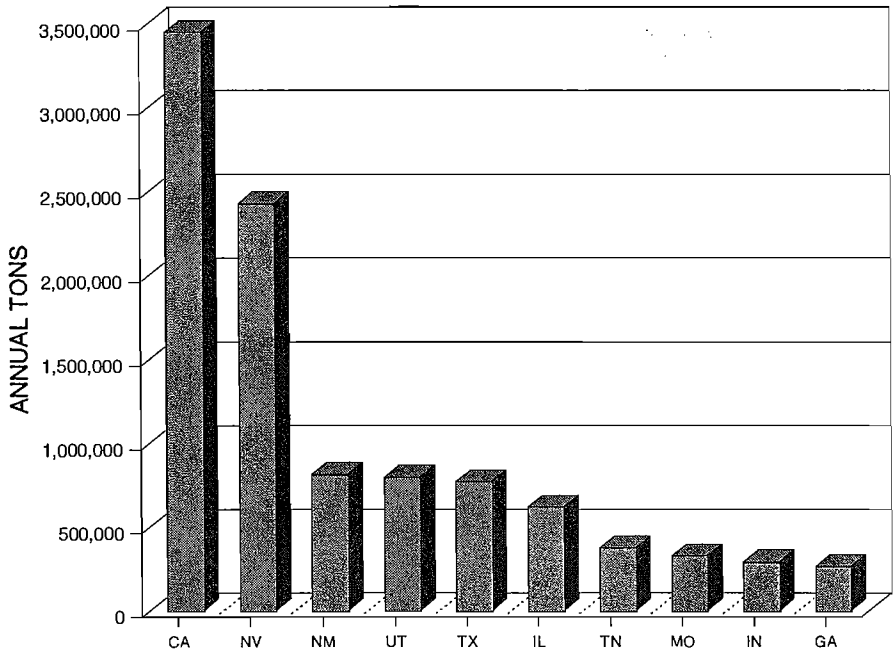
OUTGOING AND INCOMING FREIGHT IN THE MAG REGION

(National Totals for Destination and Origin of Freight by Region)

Outgoing Freight (Destination)			Incoming Freight (Origin)		
Region	**State**	**Total Tons**	**Region**	**State**	**Total Tons**
South	Georgia	265,718	**South**	Georgia	216,043
	Florida	151,520		Florida	102,770
	Tennessee	376,093		Tennessee	193,609
	Alabama	55,709		Alabama	107,080
	North Carolina	62,044		North Carolina	174,142
	Virginia	55,704		Virginia	55,377
	West Virginia	9,797		West Virginia	36,229
	Kentucky	40,534		Kentucky	56,153
	South Carolina	34,317		South Carolina	61,353
	Louisiana	83,060		Louisiana	962,141
	Mississippi	79,815		Mississippi	158,447
	Arkansas	86,436		Arkansas	604,328
		1,300,748			**2,727,673**
TOTAL OUTGOING		**22,358,354**	**TOTAL INCOMING**		**29,821,982**

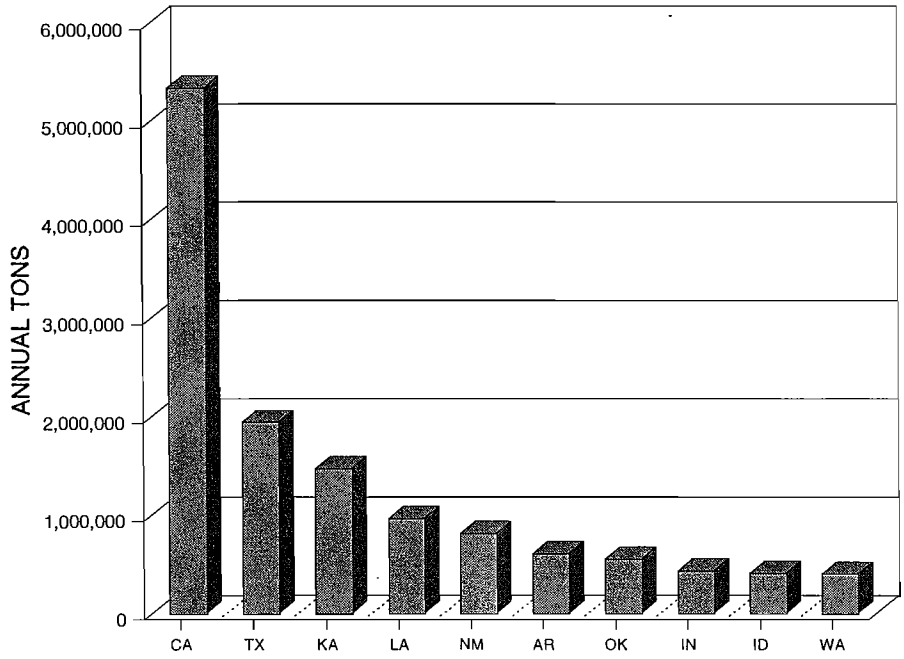
Source: Reebie Associates, Maricopa Association of Governments - * Rounding factors may cause slight variations in figures

FIGURE 22
OUTBOUND TRUCK FREIGHT FROM THE MAG REGION: TOP 10 DESTINATION STATES



Source: Reebie Associates, Maricopa Association of Governments

FIGURE 23
INBOUND TRUCK FREIGHT TO THE MAG REGION: TOP 10 ORIGIN STATES



Source: Reebie Associates, Maricopa Association of Governments

TABLE 25

OUTGOING AND INCOMING TRUCK FREIGHT IN THE MAG REGION
(Arizona Totals for Destination and Origin of Freight by County - 2001)

Outgoing Freight (Destination)		Incoming Freight (Origin)	
County	**Total Tons**	**County**	**Total Tons**
Pima	4,344,148	Pima	3,717,309
Pinal	1,492,698	Pinal	4,484,958
Yavapai	717,470	Yavapai	1,061,088
Coconino	516,590	Coconino	892,308
Cochise	489,680	Cochise	296,258
Navajo	430,912	Navajo	183,010
Mohave	401,356	Mohave	215,174
Yuma	380,052	Yuma	487,181
Gila	303,089	Gila	220,496
Apache	264,307	Apache	99,791
Santa Cruz	104,196	Santa Cruz	35,905
Graham	77,796	Graham	343,004
La Paz	45,241	La Paz	1,103
Greenlee	18,405	Greenlee	77,443
TOTAL OUTGOING	**9,585,940**	**TOTAL INCOMING**	**12,115,027**

Source: Reebie Associates, Maricopa Association of Governments/* - Represents internal origin and destination of freight

As displayed by Table 25, the primary trading partner in Arizona for outgoing and incoming goods transported by truck is Pima County, which includes the Greater Tucson Metropolitan Area. Approximately 19.4 percent of all truck freight that leaves the MAG Region is destined for Pima County. The majority of inbound freight within Arizona is shipped from Pinal County, which accounts for 15.0 percent of all incoming freight shipments. Figures 24 and 25 display freight flows for each of the counties located within the State of Arizona. As displayed, the primary counties of trade between MAG and the remainder of the state include Pima, Pinal, Yavapai, Coconino, Cochise and Yuma.

FIGURE 24
DESTINATIONS OF OUTGOING TRUCK FREIGHT FROM THE MAG REGION – ARIZONA
(By Total Tons - 2001)

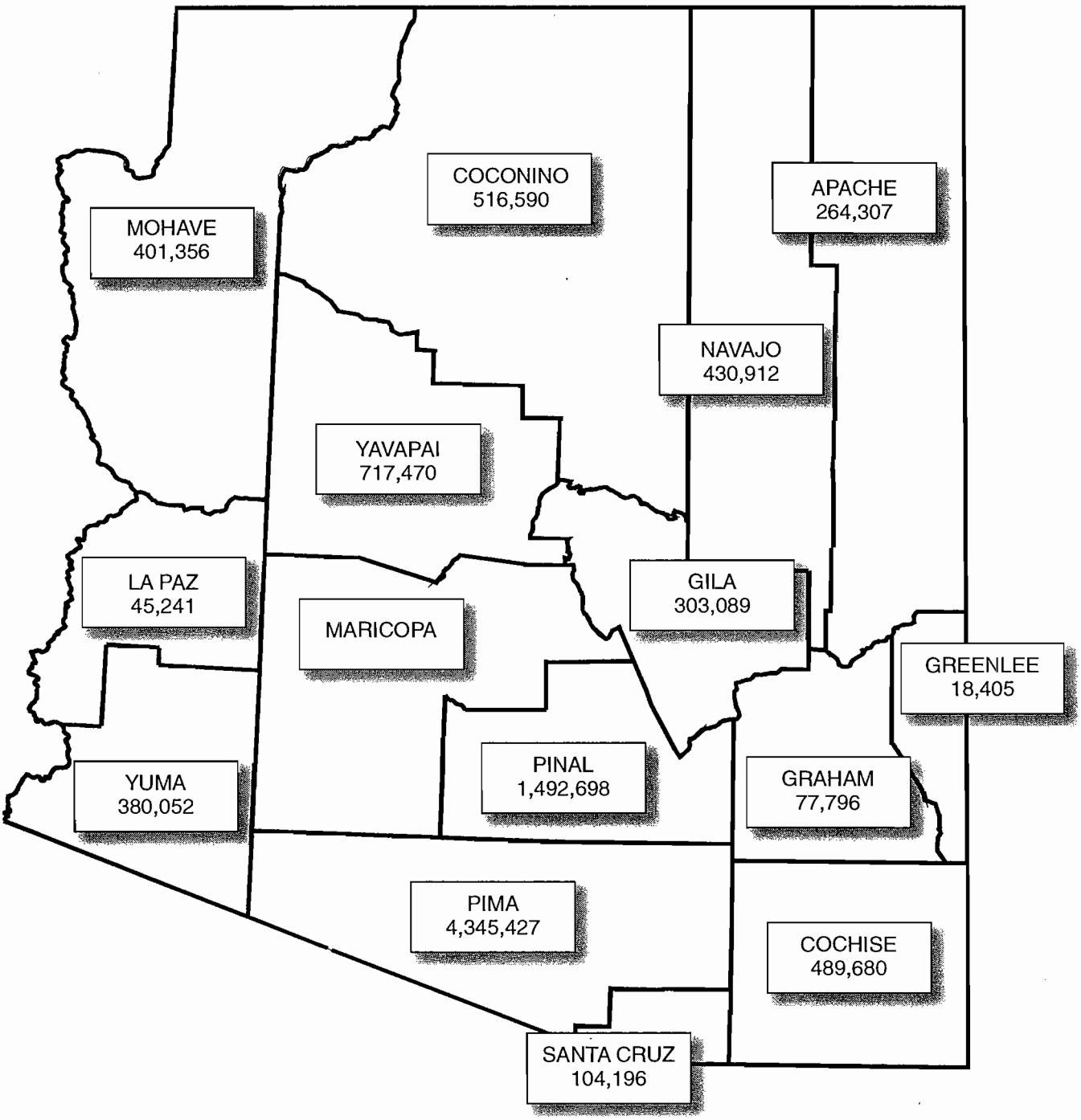


FIGURE 25
ORIGINS OF INCOMING TRUCK FREIGHT
TO THE MAG REGION – ARIZONA
(By Total Tons - 2001)

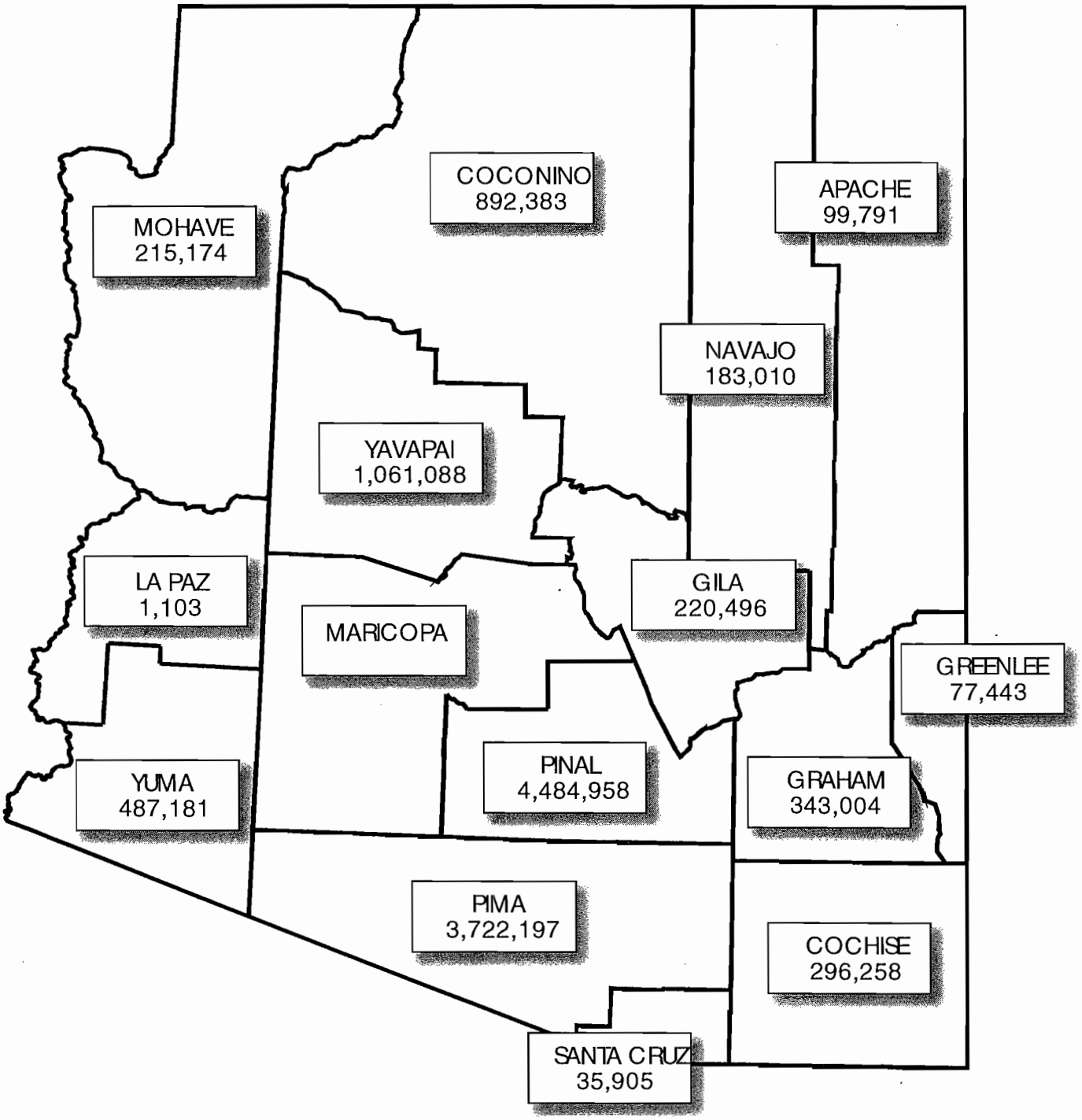


Table 26 displays the primary metropolitan trade partners for the MAG Region. The table displays the top 20 market areas for inbound and outbound truck freight. As displayed, the primary trading partner for the MAG Region is the city of Tucson. Other top trading partners include the cities of Flagstaff, Los Angeles, Las Vegas, Albuquerque and San Francisco.

TABLE 26

TRUCK FREIGHT
PRIMARY METROPOLITAN AREAS OF TRADE
(Outbound and Inbound Goods - 2001)

Outbound Freight (Destination)			Inbound Freight (Origin)		
	Metropolitan Region	Total Tons		Metropolitan Region	Total Tons
1	Tucson, Arizona	4,938,024	1	Tucson, Arizona	4,049,472
2	Los Angeles, California	2,600,800	2	Los Angeles, California	3,659,424
3	Las Vegas, Nevada	1,877,804	3	Flagstaff, Arizona	2,137,485
4	Flagstaff, Arizona	1,668,686	4	San Francisco, California	1,505,727
5	Reno, Nevada	987,322	5	Wichita, Kansas	1,340,868
6	San Francisco, California	785,726	6	Houston, Texas	539,834
7	Salt Lake City, Utah	771,700	7	Baton Rouge, Louisiana	528,100
8	Albuquerque, New Mexico	723,104	8	Dallas, Texas	497,581
9	Chicago, Illinois	442,445	9	Chicago, Illinois	412,871
10	St. Louis, Missouri	396,273	10	Albuquerque, New Mexico	386,348
11	Memphis, Tennessee	321,969	11	Tulsa, Oklahoma	360,077
12	El Paso, Texas	302,173	12	Las Vegas, Nevada	358,822
13	Denver, Colorado	218,803	13	Little Rock, Arkansas	321,780
14	Houston, Texas	190,598	14	Amarillo, Texas	309,592
15	New York, New York	184,154	15	Salt Lake City, Utah	274,128
16	Atlanta, Georgia	182,350	16	Portland, Oregon	261,580
17	San Diego, California	177,505	17	Minneapolis, Minnesota	258,226
18	Minneapolis, Minnesota	165,024	18	Kansas City, Missouri	234,866
19	Dallas, Texas	159,859	19	Denver, Colorado	233,128
20	Sacramento, California	154,716	20	Sacramento, California	221,362

Source: Reebie Associates, Maricopa Association of Governments

COMMODITY ANALYSIS

The purpose of this section is to provide a brief overview of the types of commodities that are transported by truck. This information will provide an overview of the primary commodities that are shipped out of the MAG Region, and that are also received within the region from other areas of Arizona and the United States. As similar to the information provided in the previous chapter of this document, the data contained and displayed within this section is based on the Reebie Standard Transportation Commodity Classification (STCC) system. This is a comprehensive system that is used to identify the leading commodities that are shipped and received at the 2 and 4-digit levels. The 2- digit STCC commodities represent broad categories of goods that are

easy to identify, whereas the 4-digit numbers provide more detail and are categorized into specific goods that are transported by truck.

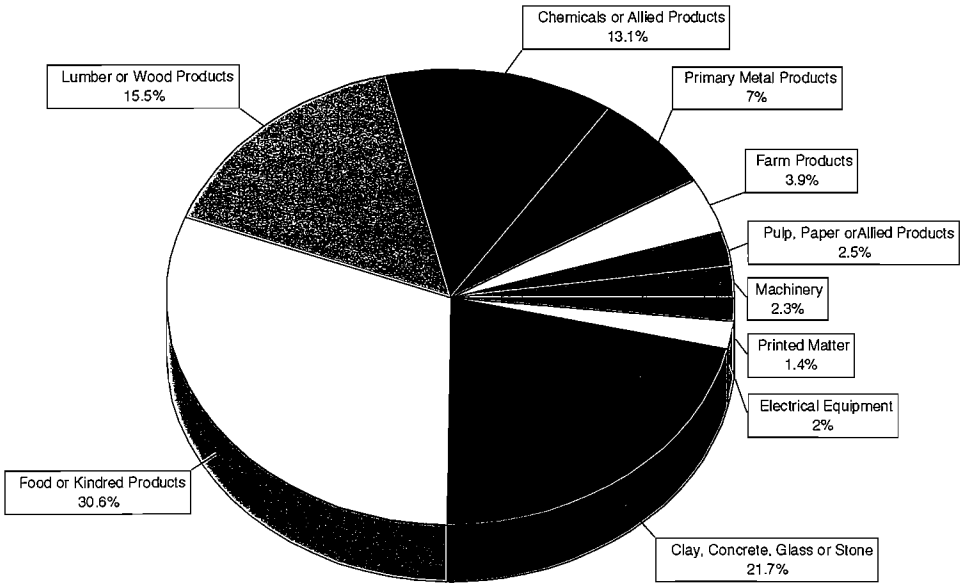
Figure 26 displays the top 10 leading commodities at the 2-digit STCC level, which were shipped from the MAG Region to other areas throughout Arizona and the United States during 2001. The primary commodities that were shipped out of the region included food or kindred products; clay, concrete glass or stone; lumber or wood products and chemicals or allied products. In 2001, almost 7 million tons of food or kindred products were exported out of the region by truck. Also, over 4.5 million tons of clay, concrete, glass or stone, and over 3 million tons of lumber or wood products, and about 3 million tons of chemicals or allied products were exported out of the region by truck.

Figure 27 displays the top 10 leading commodities at the 2-digit STCC level that were transported by truck into the MAG Region during 2001. The primary inbound commodities that were hauled by truck include food or kindred products; clay, concrete, glass or stone; non-metallic minerals; and petroleum or coal products. In 2001, over 5.5 million tons of food or kindred products; over 5 million tons of clay, concrete, glass or stone products; over 5 million tons of non-metallic minerals; and over 2.5 million tons of petroleum products were transported into the MAG Region from other areas of Arizona and the United States.

In addition to Figures 26 and 27, Table 27 displays the top 15 outbound and inbound truck commodities at the 4-digit STCC level. As displayed on Table 27, the top 5 outbound commodities that were shipped from the MAG Region to other areas by truck included concrete products, soft drinks or mineral water, nonmetallic minerals, gypsum products and potassium or sodium compound products. The top 5 inbound truck commodities at the 4-digit STCC level included non-metallic minerals; concrete products; dairy farm products, gypsum products, and petroleum refining products.

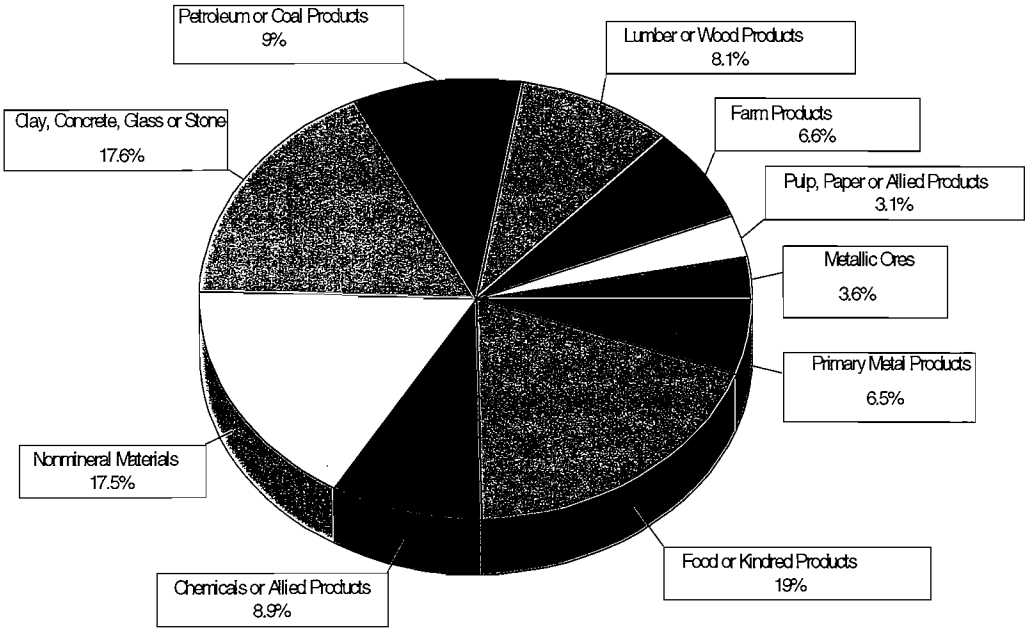
Table 28 provides information on the leading inbound and outbound commodities by total value. This table ranks rank the top commodities that are transported between the MAG Region and other areas of the country by truck in 2001. The total tons are calculated into pounds, which are then multiplied against a standard value per pound unit of transport in accordance with the standardized Reebie TRANSEARCH database, to reach a total value figure expressed in U.S. Dollars. As displayed on Table 28, the leading outbound commodities were semiconductors, ordnance, internal combustion engines, electronic components and pharmaceuticals. Semiconductors were valued at a total of $10.3 Billion dollars, which represent the highest valued cargo exported from the MAG Region by truck. As displayed on Table 28, the leading inbound commodities were electronic data processing equipment (or computers), telephones and telegraph equipment, miscellaneous plastic products, electro metallurgical products, and aircraft. Electronic data processing equipment was valued at $3.6 Billion dollars, which made it the highest valued commodity import into the MAG Region by truck during 2001.

FIGURE 26
TOP OUTBOUND TRUCK COMMODITIES FROM THE MAG REGION



Source: Reebie Associates, Maricopa Association of Governments

FIGURE 27
TOP INBOUND TRUCK COMMODITIES TO THE MAG REGION



Source: Reebie Associates, Maricopa Association of Governments

TABLE 27

LEADING OUTBOUND TRUCK COMMODITIES FROM THE MAG REGION
(Individual Commodities By 4-Digit STCC)

	Commodity	Outbound Tons
1	Concrete Products	1,835,114
2	Soft Drinks Or Mineral Water	1,603,041
3	Nonmetallic Minerals	920,818
4	Gypsum Products	829,654
5	Potassium Or Sodium Compound	817,262
6	Primary Lead Smelter Products	680,055
7	Primary Forest Materials	686,609
8	Dog, Cat Or Other Pet Food	645,849
9	Ice, Natural Or Manufactured	590,189
10	Industrial Gases	565,368
11	Flour Or Other Grain Mill Products	516,263
12	Portland Cement	483,089
13	Cottonseed Oil or By-Products	434,638
14	Plywood or Veneer	381,828
15	Miscellaneous Field Crops	367,280

LEADING INBOUND TRUCK COMMODITIES TO THE MAG REGION
(Individual Commodities By 4-Digit STCC)

	Commodity	Inbound Tons
1	Nonmetallic Minerals	1,782,352
2	Concrete Products	1,732,763
3	Dairy Farm Products	1,202,274
4	Gypsum Products	867,042
5	Petroleum Refining Products	833,958
6	Electrometallurgical Products	791,655
7	Miscellaneous Agricultural Chemicals	772,965
8	Liquefied Gases, Coal Or Petroleum	656,042
9	Primary Forest Materials	663,545
10	Metallic Ores	661,939
11	Soft Drinks Or Mineral Water	551,297
12	Leather Luggage Or Handbags	528,988
13	Miscellaneous Plastic Products	408,888
14	Potassium or Sodium Compound	378,877
15	Asphalt Coatings or Felt	358,253

Source: Reebie Associates, Maricopa Association of Governments

TABLE 28

TOTAL VALUE OF OUTBOUND TRUCK COMMODITIES FROM THE MAG REGION
(2001)

	COMMODITY	OUTBOUND TONS	TOTAL POUNDS	VALUE PER POUND (U.S. Dollars)	TOTAL VALUE (U.S. Dollars)
1	Semiconductors	71,901	143,802,000	71.647	10,302,981,894
2	Ordnance	24,416	48,832,000	43.972	2,147,240,704
3	Internal Combustion Engines	153,192	306,384,000	6.05	1,853,623,200
4	Misc. Electronic Components	49,834	99,668,000	15.053	1,500,302,404
5	Pharmaceuticals	65,528	131,056,000	7.25	950,156,000
6	Radio/TV Transmitting Equipment	12,016	24,032,000	34.894	838,572,608
7	Manufactured Homes	293,426	586,852,000	1.396	819,245,392
8	Nonferrous Wire	204,817	409,634,000	1.987	813,942,758
9	Soft Drinks of Mineral Water	1,603,041	3,206,082,000	0.237	759,841,434
10	Mechanical Measuring/Control Equip.	15,165	30,330,000	22.658	687,217,140

TOTAL VALUE OF INBOUND TRUCK COMMODITIES TO THE MAG REGION
(2001)

	COMMODITY	INBOUND TONS	TOTAL POUNDS	VALUE PER POUND (U.S. Dollars)	TOTAL VALUE (U.S. Dollars)
1	Electronic Data Processing Equip.	88,691	177,382,000	20.40	3,618,592,800
2	Telephone and Telegraph Equipment	60,932	121,864,000	16.029	1,953,358,056
3	Miscellaneous Plastic Products	408,888	817,776,000	1.730	1,414,752,480
4	Electro Metallurgical Products	791,655	1,583,310,000	0.706	1,117,816,860
5	Aircraft	7,901	15,802,000	70.319	1,111,180,838
6	Miscellaneous Agricultural Products	772,965	1,545,930,000	0.675	1,043,502,750
7	Meat Products	288,271	576,542,000	1.713	987,616,446
8	Semiconductors	6,266	12,532,000	71.647	897,880,204
9	Signs or Advertising Displays	79,917	159,834,000	5.430	867,898,620
10	Miscellaneous Printed Manner	88,217	176,434,000	4.287	756,372,558

Source: Reebie Associates, Maricopa Association of Governments

TRUCK TRADE WITH MEXICO

The trucking industry represents the primary mode of transport for goods moving between the MAG Region and the Nation of Mexico. As addressed in the previous chapter, during 2001 approximately 91.6 percent (1,548,183 tons) of all outgoing freight from the MAG Region to Mexico was hauled by truck. Also, approximately 90 percent (2,020,282 tons) of all imported freight from Mexico was hauled by truck into the MAG Region. Tables 29 and 30 display the primary outbound and inbound truck commodities during 2001. The data contained in the tables is based on information at the 3-digit STCC level. The primary Mexican commodities that are imported and exported to and from the region consist of agricultural products, metals and plastics, machinery, motor vehicles and associated components, and construction-related materials.

TABLE 29

LEADING SOUTHBOUND TRUCK COMMODITIES TO MEXICO (EXPORTS)
(Individual Commodities By 3-Digit STCC)

	Commodity	Outbound Tons
1	Plastic Matter or Synthetic Fibers	305,700
2	Field Crops	298,400
3	Miscellaneous Plastic Products	120,591
4	Miscellaneous Primary Metal Products	56,319
5	Miscellaneous Wood Products	54,154
6	Fresh Fruits or Tree Nuts	47,954
7	Petroleum	46,032
8	Portland Cement	40,476
9	Millwood or Prefabricated Wood Products	37,972
10	Nonferrous Basic Metal Shapes	37,496
11	Concrete, Gypsum or Plaster	33,879
12	Industrial Electrical Equipment	29,251
13	Miscellaneous Electrical Machinery	28,970
14	Meat or Poultry (Fresh or Chilled)	26,709
15	Paper	26,593

Source: Reebie Associates, Maricopa Association of Governments

TABLE 30

LEADING NORTHBOUND TRUCK COMMODITIES FROM MEXICO TO THE MAG REGION (IMPORTS)
(Individual Commodities By 3-Digit STCC)

	Commodity	Outbound Tons
1	Fresh Vegetables	422,272
2	Field Crops	376,649
3	Industrial Chemicals	269,450
4	Fresh Fruits or Tree Nuts	229,291
5	Canned or Preserved Food	169,864
6	Nonferrous Primary Smelter Products	114,316
7	Nonferrous Metal Basic Shapes	58,590
8	Motor Vehicles or Equipment	50,149
9	Engines or Turbines	36,257
10	Livestock or Livestock Products	34,920
11	Fresh Fish or Marine Products	21,101
12	Miscellaneous Farm Products	19,131
13	Construction Machinery or Equipment	14,381
14	General Industrial Equipment	11,374
15	Concrete, Gypsum or Plaster	11,126

Source: Reebie Associates, Maricopa Association of Governments

TRUCKING ISSUES

The purpose of this chapter was to provide an overview of the trucking freight mode, and to address issues pertaining to truck freight and facilities; major employers within the trucking industry; freight transport and freight flows; commodity analysis; and truck trade with Mexico. While the content of this chapter was structured to provide a somewhat general overview of trucking and the trucking industry, there are a variety of subjects and issues that could realistically be explored in much further detail.

Although the issues associated with trucking can be somewhat complex, they should ultimately be addressed from the perspective of enhancing efficiency and the timeliness of transport across goods movement sectors, in an effort to enhance economic prosperity. Some of the common issues and concerns of the trucking industry include items such as national, regional and local declining transportation infrastructure; congestion and capacity issues on local roadways and freeways; the need to improve or update trucking facilities and terminals; safety issues; the need to improve logistics and create better operational efficiency at truck facilities; ingress and egress concerns, and issues associated with commercial parking space, and loading and unloading docks; signalization and additional mobility issues encountered in the process of moving goods from one facility to another; the implementation of effective Intelligent Transportation Systems (ITS) in the goods movement process; the need to enhance connectivity and improve intermodal facilities; the need to assess, enhance and improve connectors between freight facilities and the road and highway networks; and a variety of other identified issues and needs that may be specific to the trucking industry at certain levels or industry segments associated with markets, logistics and operations.

Issues such as these could be addressed through a comprehensive freight planning process. Such a process involves assessing and understanding base conditions through the completion of a freight inventory and analysis, assessing infrastructure conditions, documenting needs, identifying critical issues, developing effective policies, and establishing measurable strategies to ensure the identified and desired outcome over time.

Chapter Footnotes

1. U.S. Department of Transportation, Federal Highway Administration, *U.S. Freight: Economy in Motion 1998*, Page 19, May 1998.

2. U.S. Department of Transportation, Federal Highway Administration, *U.S. Freight: Economy in Motion 1998*, Pages 18-28, May 1998.

3. U.S. Department of Transportation, Federal Highway Administration, *Comprehensive Truck Size and Weight Study: Summary Report for Phase I -- Synthesis of Truck Size and Weight (TS&W) Studies and Issues*, Pages 11-53, March 1995.

CHAPTER SIX

RAIL

The purpose of this chapter is to provide an overview of the rail freight mode in the MAG Region by assessing railroads and existing rail facilities, analyzing rail freight flows, and providing information on the types of commodities that are imported and exported by the use of rail. When considering each of the freight modes, the rail industry plays a significant part in the overall goods movement process by specializing in the transport of low value, bulk quantities of freight over long distances. While the trucking mode is responsible for transporting the majority of freight at the national and regional levels, the rail industry is significant in transporting high volumes of goods that are not necessarily time sensitive. Trains play a vital role in the freight industry by providing long haul services between points of origin and destination, and often carry bulk goods such as farm products, automobiles, coal, chemicals, food products, lumber, and metallic and nonmetallic items.

According to the U.S. Department of Transportation, Federal Highway Administration, over 14 percent of all freight at the national level is transported by rail, with an average line haul distance of 690 miles. According to compiled data from Reebie Associates, in 2001 approximately 9 percent of all inbound and outbound freight within the MAG Region was transported by rail. This accounts for a total of over 8 million tons of freight.

The operational railroads that presently maintain a presence in the MAG Region include the Union Pacific (UP) Railroad, the Burlington Northern Santa Fe (BNSF) Railway, and the Arizona and California Railroad. While each of these railroads maintain fully operational main lines and facilities within the MAG Region, the UP and BNSF are currently the only railroads that operate within the immediate metropolitan area of Greater Phoenix. Presently, the Phoenix Metropolitan Area is off the main lines of both the BNSF and the UP, and is serviced by branch lines of these companies. The remaining sections of this chapter will provide further information on the rail industry, and will address regional railroads and rail corridors; rail freight facilities; rail freight transportation within the MAG Region; commodity analysis; and rail trade with the Nation of Mexico.

OVERVIEW OF THE RAIL INDUSTRY

The railroad industry plays a major part in the American economy, and transports certain types of goods throughout the country that would not be cost-effective or

feasible to be hauled by other types of freight modes, such as truck, air or pipeline. When assessing commodities by the type of load hauled, there is usually a common correlation between the value of the cargo, the weight of the cargo, and the distance it is moved. When assessing value, many freight customers who are in need of hauling high-dollar cargos generally choose non-rail modal choices, such as truck or air. Although not always the case, the heavier the load, the more likely it is to be transported by rail. When considering domestic U.S. goods that are hauled by truck or rail, the majority of high-weight cargos over 90,000 pounds are handled by rail, whereas trucks represent the dominant form of transport for goods that are under 90,000 pounds.

Rail History

Traditionally, in the American freight movement process, goods that are extremely time sensitive are generally hauled by air, or under certain conditions, are moved rapidly through a trucking arrangement. Goods that are in need of being at a certain location within several days are sent by truck, or are sent through arranged joint-modal processes that ensure their delivery in a relatively short period of time. Railroads in the United States are essentially transporters of bulk quantity goods, which are usually hauled by multiple train carloads over long distances. Trains are often the mode of choice for low value, bulk commodities that are not extremely time sensitive. Their market function in the freight transport industry is very crucial to the overall goods movement process. Rail's importance cannot be overlooked as a high-volume mover of goods at the national, state and regional levels.

From a historic perspective, the nation's first railroads began to appear in the eastern United States during the 1830s. Shortly thereafter, railroads rapidly progressed throughout several areas of the country as population expanded and people moved westward. Between 1850 and 1880, extensive government land grants were awarded to states and railroad companies throughout the country in an effort to promote further railroad construction. During the 1850s and 1860s, the U.S. Government called for a continuous rail line that would connect the Eastern seaports to the newly settled west. The policy position taken by the government resulted in the Railroad Act of 1862. This particular legislation served as the catalyst for the first transcontinental rail, which was completed on May 10, 1862, at Promontory, Utah, when the Union Pacific and the Central Pacific railroads merged.

The popularity of rail in the United States during the 1860s as the dominant form of non-water transport of people and goods over long distances, spurred further rail construction and competition for new routes. It was this era of rail that gave rise to the first lines in the State of Arizona. The Territorial Act of 1877 resulted in the construction of the Southern Pacific line (which is now the Union Pacific) through southern Arizona. This line traversed Arizona from Yuma to the New Mexico State Line, and is still a primary line through the southern MAG Region. By the late 1920s, the primary rail system as it exists in the MAG Region today was completed.

At a national level, the U.S. Government has played an active and ongoing role in the regulation of the nation's rail industry. In 1886, the Government created the Interstate Commerce Commission (ICC), which was founded in an effort to ensure an even playing field in competition between railroads, and to also ensure that there was fairness between the industry and its customers. From the inception of the ICC until the 1970s, there were a considerable amount of regulatory requirements imposed by the government, which ranged from a variety of safety issues, to concerns over equitable pricing within the industry. The U.S. Congress ended many of the government's previously enacted economic controls over the rail industry with the passage of the Staggers Rail Act in 1980. This particular Act recognized that railroads were faced with an increased amount of competition from other freight modes, and that regulations which were enacted prior to 1980 prevented railroads from being competitive and earning sufficient revenues. Although the Staggers Act did not completely deregulate the industry, it did allow for individual railroad companies to exercise a greater range of autonomy over their operations and rates, based upon demand.

After 1980, the government continued to monitor portions of the industry that warranted concern over the lack of adequate competition. When the ICC was terminated in 1995, the Surface Transportation Board became the federal agency that was responsible for the economic regulation of railroads. Also, aside from the ICC, and subsequently the Surface Transportation Board, the U.S. Department of Transportation, Federal Railroad Administration, has been responsible for regulating and monitoring a variety of safety issues and requirements.[1]

Rail Carriers

According to the U.S. Department of Transportation, by 1995 there were a total of 531 freight railroads in the United States. Of these, the top 10 carriers, which are classified as *Class I Railroads*, generated approximately 79 percent of rail miles traveled, and 90 percent of all revenues. This is significant in terms of their dominance in the industry, since the top 10 only represented 2.3 percent of all the nation's railroads in 1995.

In 1995, the primary Class I railroads in the United States were are as follows: Burlington Northern Santa Fe (BNSF); Union Pacific (UP); CSX Corporation (CSX); Consolidated Rail Corporation (Conrail); Norfolk Southern (NS); Chicago & Northwestern (CNW); Illinois Central (IC); Kansas City Southern (KCS); Grand Trunk Western (GTW – Owned by the Canadian National); and the Soo Line (Also known as CP Rail, and was owned by the Canadian Pacific). Of the 531 identified rails in the U.S., 487 were classified as short-line carriers, which were further categorized into Local Linehaul railroads and Switching and Terminal railroads. Local Linehaul railroads are single lines that maintain operations on less than 350 miles of road, and accounted for approximately 51.2 percent of the nation's railroads in 1995. Switching and Terminal railroads are facilities that typically function in urban environments, and facilitate shipments between a number of railroads in a respective area. Switching and Terminal railroads accounted for 40.5 percent of the industry in 1995. The remaining 6 percent of

the U.S. railroad industry was comprised of Regional Operators, which are essentially smaller companies that operate in a given geographic region, and maintain at least 350 miles of operational track.[2]

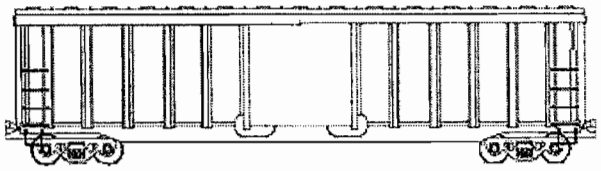
At present, the BNSF and the UP, which are among the largest in the industry, are the only Class I rail companies that are active in the State of Arizona and the MAG Region. By 2003, the Association of American Rails reported that the total number of Class I railroads in the United States had been reduced to 7. The Chicago & Northwestern (CNW) merged with the Union Pacific Railroad in 1995, and ceased to exist under the CNW name. Also, in 1997 Conrail was sold to CSX and the Norfolk Southern Corporation. The Canadian operations controlling the Grand Trunk Western and the Soo Line were consolidated into one entity (Canadian National) during 2002.

According to the Association of American Railroads, in 2001 there was a total of 143,361 operational track miles in the United States. Of this amount, a total of 68.1 percent (97,321 miles) of track was operated by Class I carriers; 14.6 percent (20,881 miles) of track was operated by Local Linehaul carriers; 12.2 percent (17,439 miles) was operated by Regional Operators; 4.6 percent (6,682 miles) of track was operated by Switching and Terminal Railroads, and 0.5 percent (728 miles) was operated by Canadian-based operators. Over 90 percent of freight railroads within the United States are privately owned, and do not receive any form of considerable government funding. Individual companies are responsible for maintaining and repairing their own tracks, and sustaining existing right-of-way upon which trains operate. Companies typically pay a considerable amount of taxes for their rails, facilities and existing right-of-way. Collectively, the existing Class I carriers that are presently conducting operations maintain the bulk share of total track miles, and overall revenues within the United States.[3]

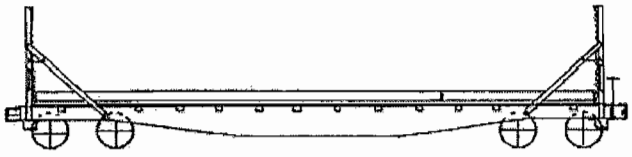
Rail Equipment and Services

The method in which freight is transported via rail depends on the type of products being moved, and the type of industries that are being served throughout the process. A typical freight train consists of a locomotive (or multiple locomotives), which pulls a number of cars that vary in direct proportion to the total amount of freight being transported. Single freight trains can consist of anywhere from several cars to over 100 cars. The speed of a train, and the amount of cars being transported vary in accordance to a variety of issues. The basic car types that are included behind a locomotive are based on the commodity and the industry being served. Although there are a variety of individual car types that are designed to meet a number of specialized needs, they can generally be categorized into one of the following five common types: boxcars, hoppers, gondolas, flat cars and tank cars. These cars are displayed in Figure 28.

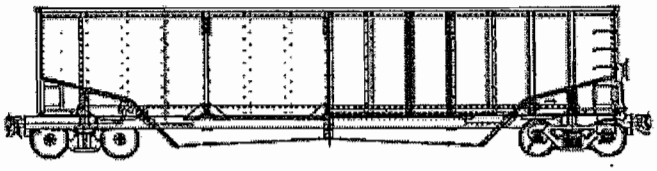
FIGURE 28
TYPES OF RAIL CARS
(Not to Scale)



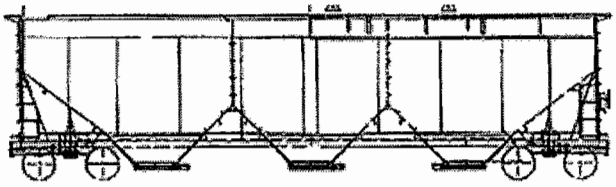
BOX CAR



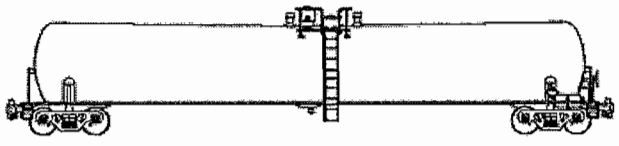
FLAT CAR



GONDOLA



HOPPER



TANK CAR

Boxcars are enclosed, water tight boxes on wheels, which are used to ship a variety of products ranging from industrial products to paper. Boxcars are the most common type of transport, and can range in size and maintain storage capacities of anywhere from 70 to 100 tons. Hoppers, which are the most numerous in the industry, consist of open and closed cars that are commonly utilized to transport agricultural products, chemical goods, coal, minerals, plastics and bulk powder products. Gondolas are essentially open boxes that are primarily utilized to carry general products such as coal, scrap iron, steel, or a variety of bulk specialty products. Flat cars are open, uncontained and exposed cars that are utilized to haul numerous bulk products. Flat cars are the standard car of choice for intermodal shipments that involve Container on Flat Car (COFC) and Trailer on Flat Car (TOFC) movements, and for products such as lumber products and steel pipes or iron. Tank cars are the standard cars of choice for hauling a variety of liquid goods associated with agricultural, manufacturing and mining activities. The sizes of cars often vary, depending upon transport and industry needs.

Aside from these standard cars as displayed in Figure 28, many railroads also transport goods through the use of refrigeration cars and transportation cars. Although not as common as typical hoppers and boxcars, transportation cars are often utilized to move vehicles via rail, and refrigeration cars are utilized to ship fresh meats and a variety of other agricultural products. According to the Association of American Railroads, in 2002 there were a total of 1,314,136 freight cars that are in active service within the United States. Approximately 52.4 percent (688,806) of these cars were owner by individual car companies and shippers; 38 percent (499,860) were owned by one of the 7 Class I carriers that are operational within the United States; and the remaining 9.6 percent (125,470) were owned by "other" entities, such as Linehaul operators and Regional Railroads. [4]

In an attempt to enhance profitability, railroads have consistently reviewed and identified markets for additional opportunities, and have provided higher levels of service at competitive rates in an effort to compete against other modes of transport. Many railroads have concentrated on market ventures such as providing increased levels of intercity freight transport; maintaining and increasing existing bulk commodity streams; and have capitalized on intermodal freight and the container industry.[5] The American railroads have identified such initiatives in an effort to improve service, thus allowing them to compete with each other and the trucking industry for freight traffic.

Efforts to compete over the last 10 years have included the implementation of new technologies, such as the transporting of double-stack cars, and the provision of COFC and TOFC services. These new technologies provided for increased economies of scale, allowed for faster service, and have also enhanced multimodal coordination. In the future, it is anticipated that the major companies in the American rail industry will continue to enhance existing services, and seek out new and profitable ventures in an effort to generate sufficient revenues. They will also have to seek out profitable opportunities that will allow them to make the necessary infrastructure and equipment investments to sustain existing and future operations.

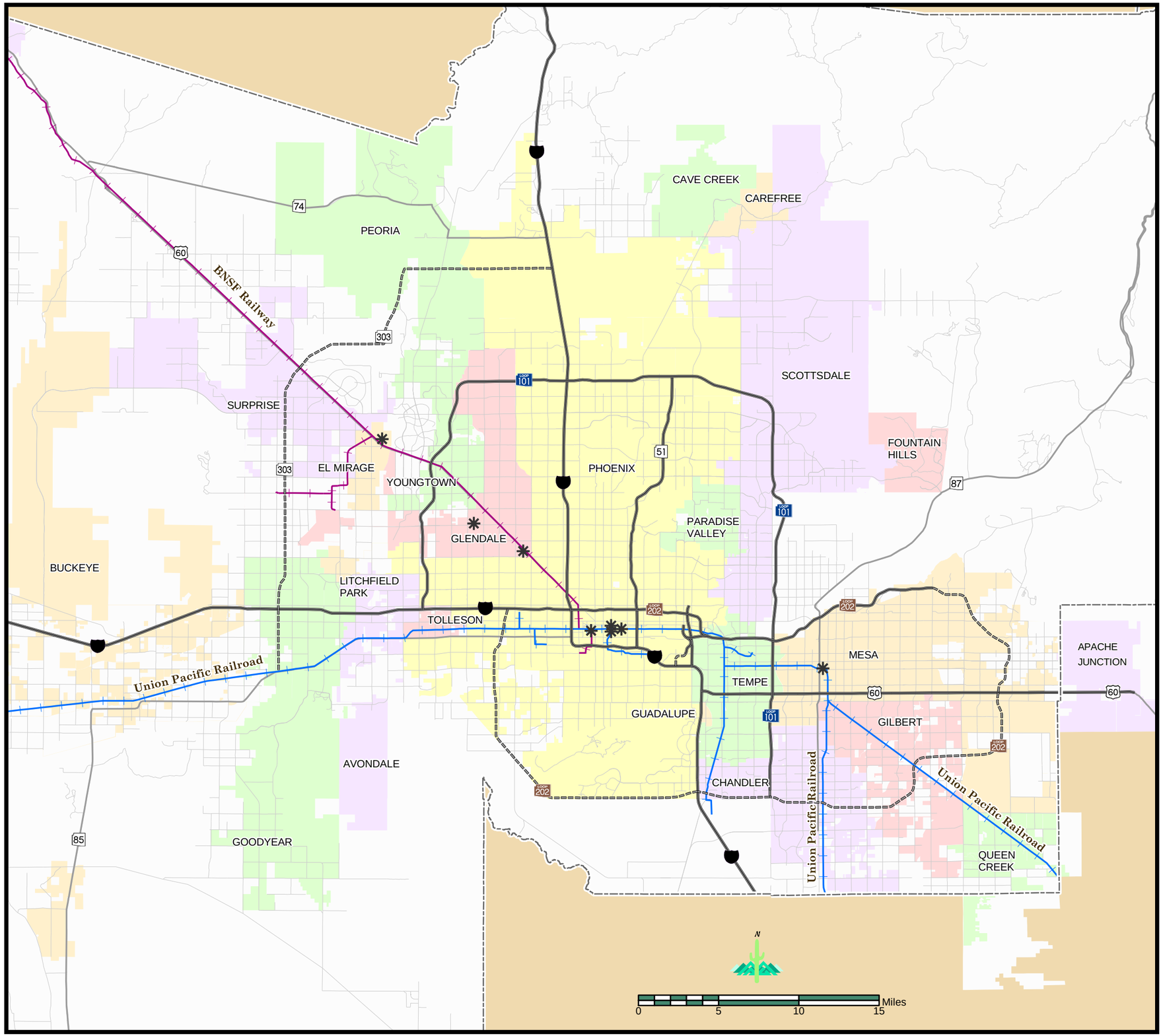
The following sections of this chapter will assess railroads that are operational in the MAG Region, and will also provide an overview of existing rail facilities. In addition, the chapter will provide information on commodities; imports and exports; freight flows; and will assess rail trade with the Nation of Mexico.

REGIONAL RAILROADS AND FACILITIES

At present, there are a total of three operational railroads in the MAG Region. These railroads include the Burlington Northern and Santa Fe Railway (BNSF), the Union Pacific Railroad (UP), and the Arizona and California Railroad (ARZC). The BNSF and the UP are classified as Class I carriers, whereas the ARZC is considered to be an active Short Line, or Linehaul railroad. As of 2003, the BNSF maintained approximately 70 miles of active track in the MAG Region, the UP maintained a total of 180 miles of active track, and the ARZC maintained a total of about 27 miles of active track. Map 11 displays the location of railroads in the immediate metropolitan region. However, due to their rural nature, the extreme southern line of the UP and the existing ARZC line are not displayed on Map 11. The southern line of the UP travels across the region from Pinal County in the east, through the Town of Gila Bend, and on to the border of Yuma County in the west. The ARZC is located in the far northwest region of MAG. The ARZC line branches off from the UP line near the Town of Wickenburg, and exits the region at the La Paz County border, located on the western boundary of the MAG Region. The ARZC primarily serves as an overflow service for BNSF, and for their freight movements associated with incoming and outgoing goods to California.

From a broader, regional and national perspective, the BNSF and the UP railroads maintain lines that are part of an integrated, transcontinental system. The BNSF maintains operations in the MAG area along the Grand Avenue corridor and extends from Downtown Phoenix, to the northwest through the Town of Wickenburg. This line extends across Yavapai and Coconino Counties, to a junction near Flagstaff, Arizona. From that point, one of the BNSF main lines travels east and west across the state for a distance of approximately 390 miles, and connects the northern Arizona Communities of Kingman, Flagstaff and Holbrook. The northern BNSF line integrates into a number of existing BNSF lines, and functions as an important link between the ports of California, the Chicago metropolitan area, and East Coast markets. Presently, all BNSF overhead traffic from the West Coast that does not travel between Flagstaff and Phoenix is provided by the ARZC, which provides service to a number of California markets.

The UP rail located in the Phoenix metropolitan area is essentially a northern track network that extends from the southern main line, located in the southern MAG Region. The southern MAG UP line travels east and west throughout the region and the State of Arizona, and serves as a viable east-west transcontinental connection between southern California; the City of Chicago; the ports of the Gulf Coast; markets in the eastern U.S.; and a number of cities throughout the south.



MAG Regional Freight Assessment

Map 11

RAIL FREIGHT

- Intermodal Facilities
- BNSF Railway
- Union Pacific Railroad
- Existing Freeway\Expressway
- Planned Freeway\Expressway
- Highways
- Major Road

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Within the MAG Region, the northern UP branch extends from its origin in central Pinal County, and enters into the metropolitan area from the Southeast Valley. The UP line travels west into downtown and terminates near the Palo Verde nuclear facility in the west valley. The northern MAG UP line used to travel westward from Phoenix and reconnect with the southern UP line near Wellton, Arizona, which is located in Yuma County. However, the track was officially abandoned by the UP in 1996, and trains no longer travel between the Palo Verde and Wellton sites. Today, all northbound and southbound freight to Phoenix that travels along the existing UP lines originates near Picacho Junction, which is located near the City of Eloy in central Pinal County.

Within the MAG Region, each of the existing railroad companies that are presently conducting operations are primarily involved in the movement of freight. The only section of rail that presently contains Amtrak passenger service is located in southern Maricopa County along the UP mainline. The Phoenix metropolitan area presently lacks any viable form of commuter or passenger rail service.

As displayed in Table 4 of Chapter 3 of this document, BNSF currently maintains four active intermodal facilities within the MAG Region. These facilities include a 65-Acre Auto Distribution Center located in the City of El Mirage; a 38-Acre intermodal yard in the City of Glendale; a 25-Acre freight yard located in the City of Glendale; and a Phoenix Team Track located on 9th Avenue. By definition, a team track is essentially a facility that is utilized by rail shippers and receivers that do not have direct access to rail service. These types of facilities usually lack on-site railroad management and on-site intermodal rail equipment for the transferring of goods. Typically, team tracks maintain access areas for transferring goods from a rail car to a truck, and in some cases, maintain loading docks that are necessary to facilitate the efficient transfer of goods.

In addition to BNSF, as displayed in Table 4, the UP also maintains four active intermodal facilities, which include a 25-Acre auto yard in the City of Phoenix; an additional 29-Acre yard in the City of Phoenix; and two team track facilities located in Mesa and Phoenix. All BNSF and UP freight operations utilize numerous tracks, and each company also maintains their respective areas of right-of-way within their designated track areas, transfer areas, and switching facilities. The primary modes of access for all eight of the BNSF and UP intermodal facilities identified in Table 4 and on Map 11 include rail and truck. In addition to the intermodal facilities and team tracks, both the BNSF and the UP directly serve a variety of industries along their trackage in the region.

RAIL TRANSPORT IN THE MAG REGION

In 2001, there was a total of 8,071,403 tons of inbound and outbound rail freight moving in and out of the MAG Region. Of this amount, 88.2 percent (7,117,336 tons) was inbound, and 11.8 percent (954,067) was outbound from the region. When assessing the types of movements that occur in the rail industry, most goods are either categorized as being transported by carload or intermodal rail. Unlike other areas of the

country where intermodal rail freight can be transferred by truck, pipeline, air or water, within the MAG Region, the only connecting mode with intermodal rail freight is through truck.

By definition, Intermodal rail is considered freight that utilizes various combinations, such as highway and rail. This is common for COFC and TOFC movements, where the long haul portion of the trip is conducted by rail flat car, and the pickup or delivery of the container or trailer is conducted by truck. By contrast, carload rail freight is non-intermodal; however, carload cargoes may be transferred to trucks for further distribution. The majority of carload freight that is hauled by train is typically transported by box cars, hoppers, gondolas, tank cars, and non-intermodal flat car movements. As displayed in Table 31, carload transport accounts for almost 64 percent of outbound freight, and 88 percent of all inbound freight. In 2001, approximately 85 percent of all rail freight was transported by carload, whereas only 15 percent was considered Intermodal.

TABLE 31

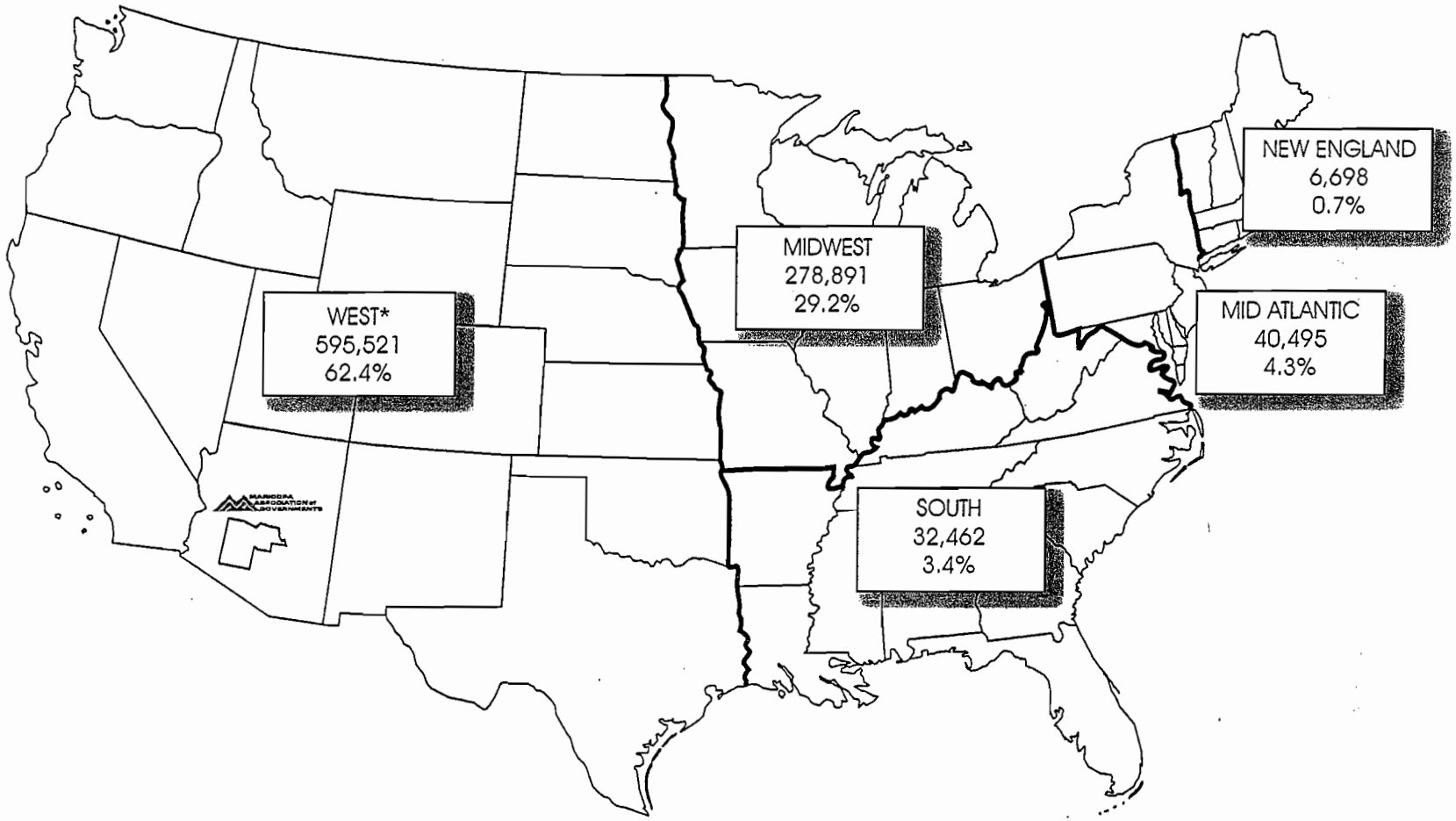
RAIL MOVEMENTS IN THE MAG REGION
(By Type – 2001)

OUTBOUND RAIL FREIGHT		
Type of Movement	**Total Tons**	**Percent**
Carload	606,301	63.6
Intermodal	347,766	36.4
Total	954,067	100.0
INBOUND RAIL FREIGHT		
Type of Movement	**Total Tons**	**Percent**
Carload	6,261,089	88.0
Intermodal	856,247	12.0
Total	7,117,336	100.0

Source: Reebie Associates, Maricopa Association of Governments

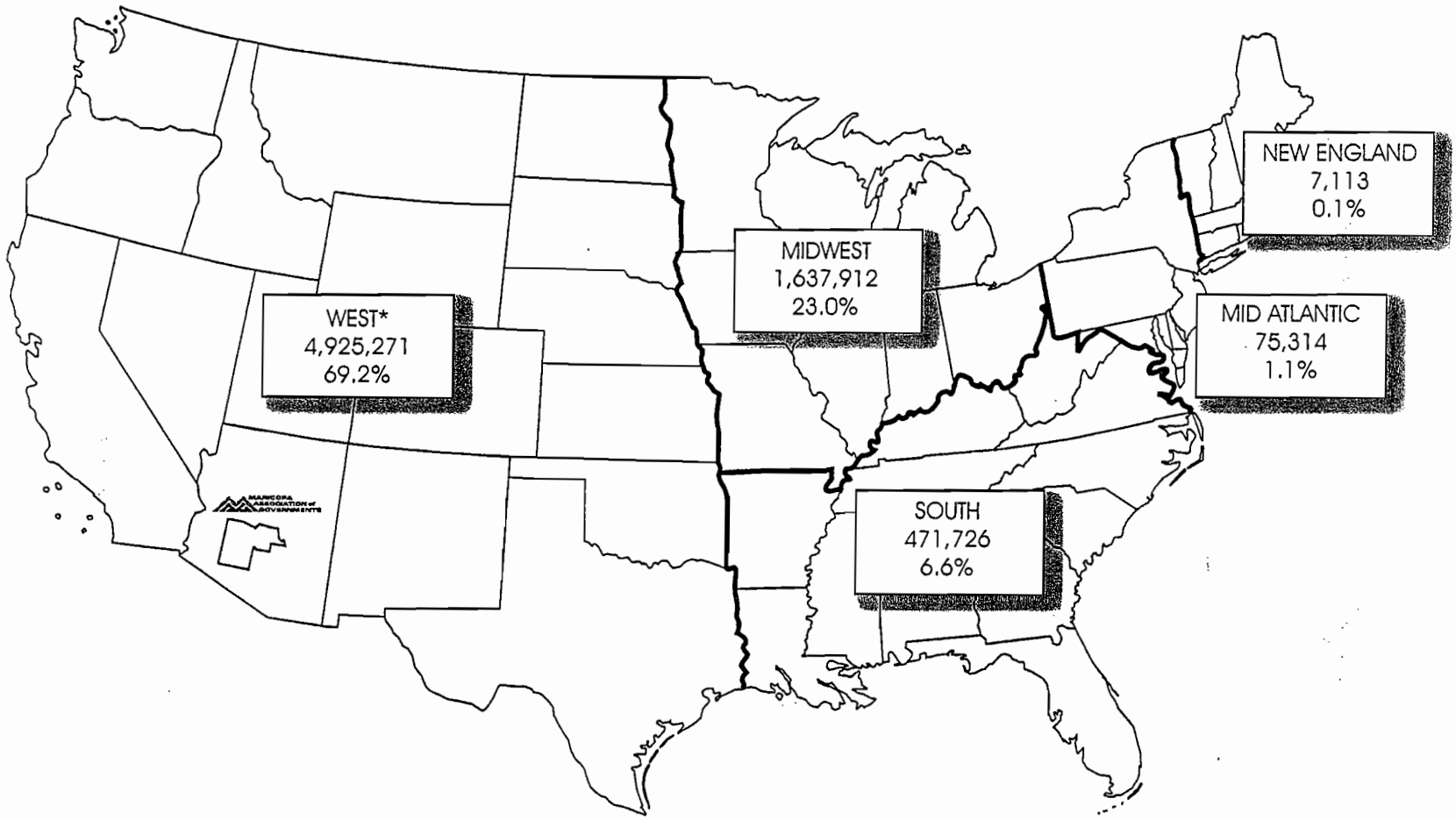
Aside from the type of movements that occur, Table 32, as well as Figures 29 and 30, provide information on the origins and destinations of all rail freight in the MAG Region. As displayed on Figure 29, approximately 62.4 percent of all outgoing rail freight was sent to areas throughout the West; 29.2 percent was sent to the Midwest; 4.3 percent was sent to the Mid-Atlantic States; 3.4 percent was sent to the South; and the remaining 0.7 percent of all rail freight was sent to the New England states. Approximately 9 percent of all outbound rail freight from the MAG Region is destined for other counties within the State of Arizona.

FIGURE 29
DESTINATIONS OF OUTGOING RAIL FREIGHT FROM THE MAG REGION — NATIONAL
(By Total Tons-2001)



*INCLUDES AREAS WITHIN ARIZONA (OUTSIDE OF MARICOPA COUNTY).

FIGURE 30
ORIGINS OF INCOMING RAIL FREIGHT TO THE MAG REGION — NATIONAL
(By Total Tons-2001)



*INCLUDES AREAS WITHIN ARIZONA (OUTSIDE OF MARICOPA COUNTY).

TABLE 32

OUTGOING AND INCOMING RAIL FREIGHT IN THE MAG REGION
(National Totals for Destination and Origin of Truck Freight by Region - 2001)

Outgoing Freight (Destination)			Incoming Freight (Origin)		
Region	**State**	**Total Tons**	**Region**	**State**	**Total Tons**
New England	Rhode Island	0	**New England**	Rhode Island	0
	New Hampshire	0		New Hampshire	0
	Connecticut	0		Connecticut	0
	Massachusetts	5,759		Massachusetts	4,257
	Maine	939		Maine	2,856
	Vermont	0		Vermont	0
		6,698			**7,113**
Midwest	Wisconsin	1,168	**Midwest**	Wisconsin	54,452
	Michigan	839		Michigan	11,105
	Ohio	1,773		Ohio	47,769
	Indiana	4,896		Indiana	106,876
	Illinois	249,723		Illinois	844,399
	Missouri	16,293		Missouri	284,650
	Minnesota	3,035		Minnesota	84,342
	Iowa	1,164		Iowa	204,319
		278,891			**1,637,912**
Mid-Atlantic	New Jersey	26,112	**Mid-Atlantic**	New Jersey	13,256
	Pennsylvania	13,126		Pennsylvania	50,715
	New York	1,257		New York	6,328
	Delaware	0		Delaware	0
	Washington DC	0		Washington DC	0
	Maryland	0		Maryland	5,015
		40,495			**75,314**
West	Arizona	85,427	**West**	Arizona	949,739
	California	192,230		California	1,337,945
	Nevada	4,656		Nevada	5,015
	New Mexico	42,750		New Mexico	306,823
	Utah	26,652		Utah	120,391
	Texas	146,425		Texas	855,290
	Colorado	41,123		Colorado	82,221
	Kansas	25,599		Kansas	177,985
	Oklahoma	8,510		Oklahoma	99,267
	Oregon	18,776		Oregon	357,759
	Washington	3,373		Washington	263,031
	Idaho	0		Idaho	148,684
	Wyoming	0		Wyoming	11,911
	Montana	0		Montana	106,606
	Nebraska	0		Nebraska	90,468
	South Dakota	0		South Dakota	0
	North Dakota	0		North Dakota	12,136
	Alaska	0		Alaska	0
	Hawaii	0		Hawaii	0
		595,521			**4,925,271**

(Continued)

OUTGOING AND INCOMING FREIGHT IN THE MAG REGION

(National Totals for Destination and Origin of Freight by Region)

Outgoing Freight (Destination)			Incoming Freight (Origin)		
Region	**State**	**Total Tons**	**Region**	**State**	**Total Tons**
South	Georgia	2,623	**South**	Georgia	3,126
	Florida	328		Florida	6,153
	Tennessee	1,696		Tennessee	61,528
	Alabama	8,747		Alabama	34,152
	North Carolina	446		North Carolina	22,562
	Virginia	0		Virginia	0
	West Virginia	0		West Virginia	11,002
	Kentucky	0		Kentucky	20,241
	South Carolina	0		South Carolina	6,191
	Louisiana	943		Louisiana	166,728
	Mississippi	2,188		Mississippi	17,347
	Arkansas	15,491		Arkansas	122,696
		32,462			**471,726**
TOTAL OUTGOING		**954,067**	**TOTAL INCOMING**		**7,117,336**

Source: Reebie Associates, Maricopa Association of Governments - * Rounding factors may cause slight variations in figures

Figure 30 displays the origins of all inbound rail freight into the MAG Region from other regions of the country. In 2001, approximately 69.2 percent of all inbound freight originated from the West; 23 percent originated from the Midwest; 6.6 percent originated from the South; 1.1 percent originated from the Mid-Atlantic; and the remaining 0.1 percent originated from the New England states. Also, about 13.3 percent of all inbound freight originated from other areas within the State of Arizona. From the MAG Region, the primary outbound metropolitan markets for rail freight include the cities of Tucson, Flagstaff, and Los Angeles. The major metropolitan market areas that ship the highest levels of rail freight into the MAG Region include, in order, the cities of Los Angeles, Chicago, Kansas City and the Dallas-Ft. Worth region.

Table 32 identifies the total amount of rail freight that was outgoing from, and incoming to the MAG Region in 2001. Figures 31 and 32 display the top 10 states of origin and destination outside of Arizona. The primary states (in order) for outbound rail freight are Illinois, California, Texas, New Mexico, Colorado and Utah. The primary states of origin (in order) for inbound rail freight are California, Illinois, Oregon, New Mexico, and Missouri. Outside of the Arizona trade area, the primary trading partners for all inbound and outbound truck movements are the states of California and Illinois.

Table 33 displays the primary metropolitan trade partners for the MAG Region. The table displays the top 20 market areas for inbound and outbound rail freight. As

TABLE 33

RAIL FREIGHT
PRIMARY METROPOLITAN AREAS OF TRADE
(Outbound and Inbound Goods - 2001)

Outbound Freight (Destination)			Inbound Freight (Origin)		
	Metropolitan Region	Total Tons		Metropolitan Region	Total Tons
1	Chicago, Illinois	197,940	1	Tucson, Arizona	932,000
2	Los Angeles, California	63,075	2	Los Angeles, California	883,469
3	Salt Lake City, Utah	47,220	3	Chicago, Illinois	760,672
4	Dallas, Texas	46,848	4	Kansas City, Missouri	373,866
5	Albuquerque, New Mexico	35,954	5	Houston, Texas	235,390
6	Flagstaff, Arizona	35,505	6	Portland, Oregon	232,174
7	San Antonio, Texas	32,438	7	Flagstaff, Arizona	195,198
8	Pueblo, Colorado	30,462	8	Albuquerque, New Mexico	188,747
9	Tucson, Arizona	30,100	9	Dallas, Texas	168,458
10	El Paso, Texas	25,730	10	Spokane, Washington	168,398
11	Kansas City, Missouri	20,460	11	Eugene, Oregon	159,478
12	New York, New York	20,054	12	Seattle, Washington	145,402
13	Fresno, California	17,554	13	Amarillo, Texas	138,586
14	San Francisco, California	16,678	14	Hobbs, New Mexico	134,586
15	Houston, Texas	15,722	15	San Francisco, California	115,472
16	Beaumont, Texas	15,494	16	Cedar Rapids, Iowa	110,732
17	Memphis, Tennessee	11,840	17	El Paso, Texas	93,724
18	Boston, Massachusetts	9,760	18	St. Louis, Missouri	88,508
19	Portland, Oregon	9,650	19	Wichita, Kansas	87,609
20	Tulsa, Oklahoma	7,238	20	San Antonio, Texas	84,776

Source: Reebie Associates, Maricopa Association of Governments

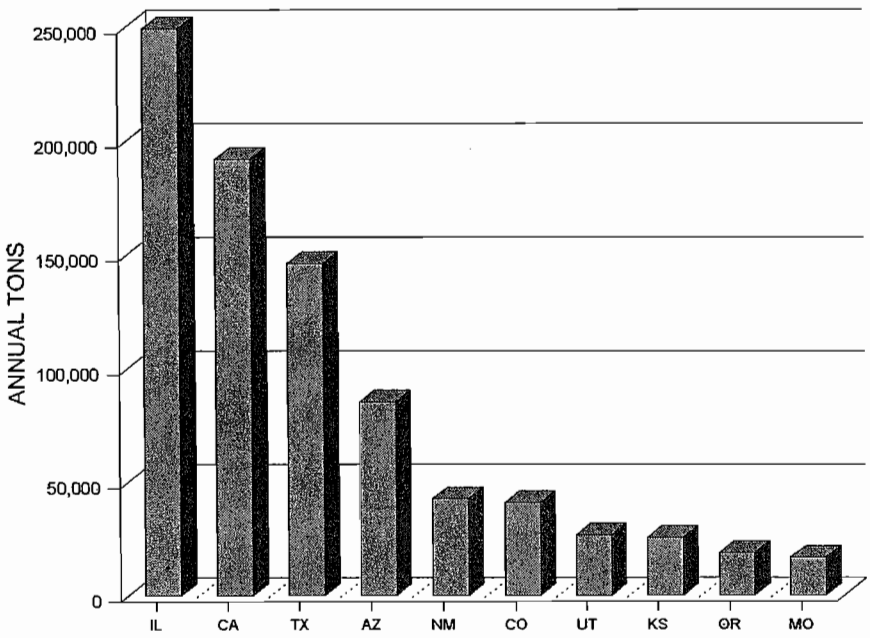
displayed, the primary trading partner for the MAG Region is the city of Tucson. Other top trading partners include the cities of Chicago and Los Angeles.

COMMODITY ANALYSIS

The purpose of this section is to provide an overview of the types of commodities that are transported by rail. Similar to the information provided in the previous chapters of this document, the data contained and displayed within this section is based on the Reebie Standard Transportation Commodity Classification (STCC) system.

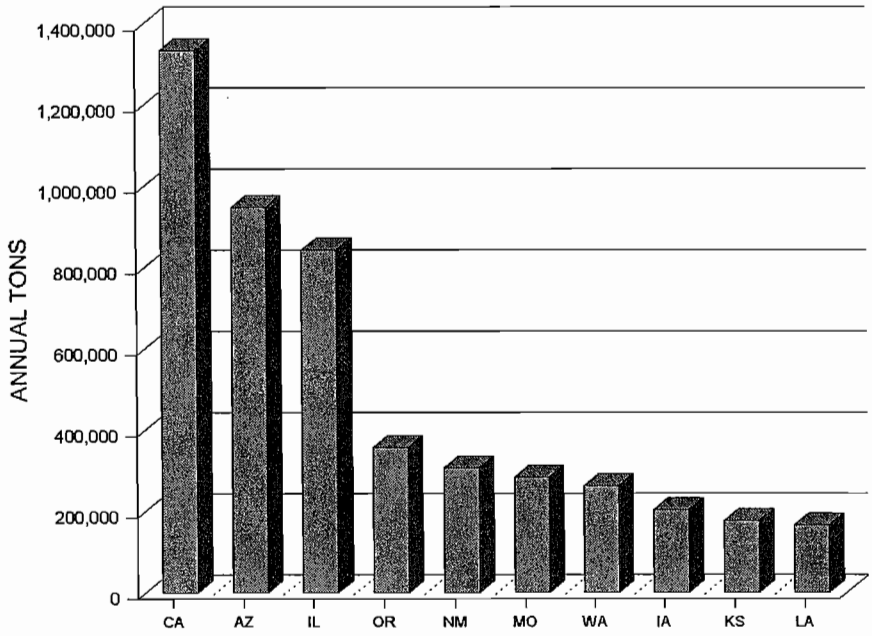
Figure 33 displays the top 10 leading commodities at the 2-digit STCC level, which were shipped from the MAG Region to other areas throughout Arizona and the United States during 2001. The primary commodities that were shipped out of the region included waste, or scrap metals; farm products; clay, concrete, glass or stone; food or kindred products; and lumber or wood products. In 2001, about 330,000 tons of waste and scrap metal materials were shipped out of the region by rail. Also, over 100,000 tons of farm products and clay, concrete, glass or stone, were exported out of the region.

FIGURE 31
OUTBOUND RAIL FREIGHT FROM THE MAG REGION: TOP 10 DESTINATION STATES



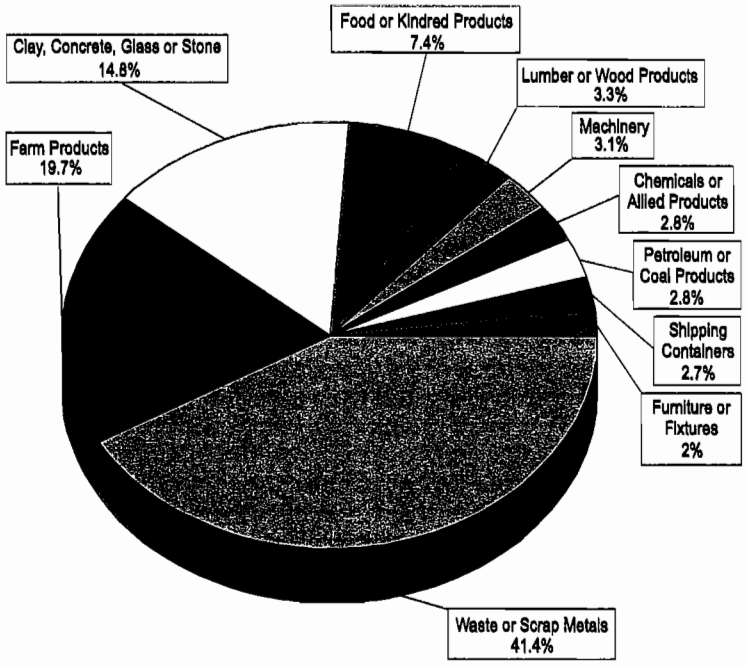
Source: Reebie Associates, Maricopa Association of Governments

FIGURE 32
INBOUND RAIL FREIGHT TO THE MAG REGION: TOP 10 ORIGIN STATES



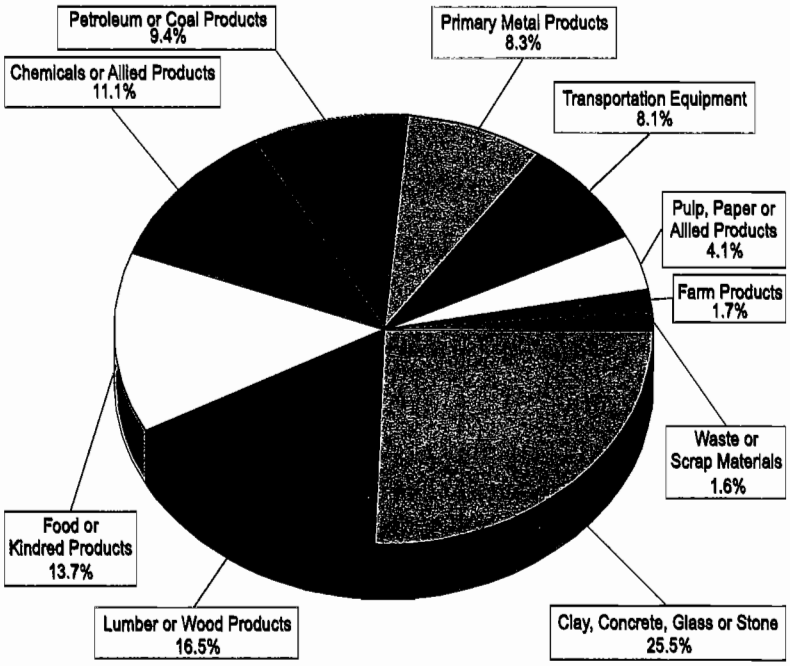
Source: Reebie Associates, Maricopa Association of Governments

FIGURE 33
TOP OUTBOUND RAIL COMMODITIES FROM THE MAG REGION



Source: Reebie Associates, Maricopa Association of Governments

FIGURE 34
TOP INBOUND RAIL COMMODITIES TO THE MAG REGION



Source: Reebie Associates, Maricopa Association of Governments

TABLE 34

LEADING OUTBOUND RAIL COMMODITIES FROM THE MAG REGION
(Individual Commodities By 4-Digit STCC)

	Commodity	Outbound Tons
1	Metal Scrap or Tailings	216,102
2	Grain	93,215
3	Paper Waste or Scrap	76,380
4	Nonmetal Minerals	75,872
5	Miscellaneous Glassware	40,031
6	Primary Copper Smelter Products	35,790
7	Chemical or Petroleum Waste	35,226
8	Miscellaneous Fresh Vegetables	33,902
9	Nonmetallic Minerals	32,720
10	Animal By-Products	27,530
11	Miscellaneous Machinery or Parts	24,637
12	Liquefied Gases (Coal or Petroleum)	22,233
13	Miscellaneous Wood Products	15,827
14	Miscellaneous Industrial Organic Chemicals	14,553
15	Household or Office Furniture	9,916

LEADING INBOUND RAIL COMMODITIES TO THE MAG REGION
(Individual Commodities By 4-Digit STCC)

	Commodity	Inbound Tons
1	Portland Cement	1,352,622
2	Lumber or Dimension Stock	562,538
3	Motor Vehicles	503,710
4	Petroleum Refining Products	452,582
5	Primary Metal or Steel Products	403,486
6	Miscellaneous Wood Products	350,025
7	Plastic Matter or Synthetic Fibers	204,635
8	Wet Corn Milling or Milo	176,726
9	Nonmetal Minerals	168,771
10	Grain	163,615
11	Malt Liquors	152,112
12	Metallic Ores	151,602
13	Miscellaneous Industrial Organic Chemicals	139,755
14	Concrete Products	132,082
15	Plywood or Veneer	112,459

Source: Reebie Associates, Maricopa Association of Governments

Figure 34 displays the top 10 leading commodities at the 2-digit STCC level that were transported by rail into the MAG Region during 2001. The primary inbound commodities that were hauled by rail include clay, concrete, glass or stone; lumber or wood products; food or kindred products; chemicals or allied products; and petroleum or coal products. In 2001, approximately 1.5 million tons of clay, concrete, glass or stone; and approximately one million tons of lumber or wood products were transported into the MAG Region from other areas of Arizona and the United States.

In addition to Figures 33 and 34, Table 34 displays the top 15 outbound and inbound rail commodities at the 4-digit STCC level. As displayed on Table 31, the top 5 outbound commodities that were shipped from the MAG Region to other areas by rail included metal scraps or tailings; grain; paper waste or scrap; nonmetal minerals; and miscellaneous glassware. The top 5 inbound rail commodities at the 4-digit STCC level included Portland cement; grain; lumber or dimension stock; motor vehicles and petroleum refining products.

Table 35 provides information on the leading inbound and outbound commodities by total value. This table ranks rank the top commodities that are transported between the MAG Region and other areas of the country by rail in 2001. The total tons are calculated into pounds, which are then multiplied against a standard value per pound

TABLE 35

TOTAL VALUE OF OUTBOUND RAIL COMMODITIES FROM THE MAG REGION
(2001)

	COMMODITY	OUTBOUND TONS	TOTAL POUNDS	VALUE PER POUND (U.S. Dollars)	TOTAL VALUE (U.S. Dollars)
1	Miscellaneous Machinery or Parts	24,637	49,274,000	5.170	254,746,580
2	Glassware	40,031	80,062,000	1.569	125,617,278
3	Primary Copper Smelter Products	35,790	71,580,000	0.938	67,142,040
4	Household or Office Furniture, NEC*	9,916	19,832,000	1.895	37,581,640
5	Inedible Animal By-Products	27,530	55,060,000	0.493	27,144,580
6	Fresh Vegetables	33,902	67,804,000	0.273	18,510,492
7	Industrial Organic Chemicals	14,553	29,106,000	0.496	14,436,576
8	Liquefied Gases, Coal or Petroleum	22,233	44,466,000	0.168	7,470,288
9	Grain	93,215	186,430,000	0.040	7,457,200
10	Misc. Nonmetallic Minerals, NEC	32,720	65,440,000	0.091	5,955,040

TOTAL VALUE OF INBOUND RAIL COMMODITIES TO THE MAG REGION
(2001)

	COMMODITY	INBOUND TONS	TOTAL POUNDS	VALUE PER POUND (U.S. Dollars)	TOTAL VALUE (U.S. Dollars)
1	Motor Vehicles	503,710	1,007,420,000	3.423	3,448,398,660
2	Primary Iron or Steel Products	403,486	806,972,000	1.391	1,122,498,052
3	Plastic Matter or Synthetic Fibers	204,635	409,270,000	0.780	319,230,600
4	Lumber	562,538	1,125,076,000	0.224	252,017,024
5	Petroleum Refining Products	452,582	905,164,000	0.174	157,498,536
6	Paper	123,190	246,380,000	0.574	141,422,120
7	Miscellaneous Wood Products	350,025	700,050,000	0.171	119,708,550
8	Portland Cement	1,352,622	2,705,244,000	0.032	86,567,808
9	Malt Liquors	152,112	304,224,000	0.269	81,836,256
10	Industrial Organic Chemicals	139,755	279,510,000	0.163	45,560,130

Source: Reebie Associates, Maricopa Association of Governments * - *Not Elsewhere Classified*

unit of transport in accordance with the standardized Reebie TRANSEARCH database, to reach a total value figure expressed in U.S. Dollars. As displayed on Table 35, the leading outbound commodities were miscellaneous machinery and parts; glassware; primary copper smelter products; household or office furniture; and inedible animal by-products. Miscellaneous machinery and parts were valued at a total of $254 Million dollars, which represent the highest valued cargo exported from the MAG Region by rail. As displayed on Table 35, the leading inbound commodities were motor vehicles; primary iron or steel products; plastic matter or synthetic fibers; lumber; and petroleum refining products. Motor vehicles were valued at $3.4 Billion dollars, which made this particular commodity the highest valued import into the MAG Region by rail during 2001.

TRADE WITH MEXICO

During 2001, approximately 8.5 percent (8,071,403 tons) of all outgoing freight from the MAG Region to Mexico was hauled by rail. Also, approximately 8.4 percent (142,982 tons) of all imported freight from Mexico was hauled by rail into the MAG Region. Tables 36 and 37 display the primary outbound and inbound rail commodities during 2001. The data contained in the tables is based on information at the 3-digit STCC level. The primary Mexican commodities that are imported and exported to and from the region consist of agricultural products, motor vehicles and associated equipment, and cement.

TABLE 36

LEADING SOUTHBOUND RAIL COMMODITIES TO MEXICO (EXPORTS)
(Individual Commodities By 3-Digit STCC)

	Commodity	Outbound Tons
1	Field Crops	80,445
2	Miscellaneous Food Preparations	22,541
3	Steel Mill Products	20,187
4	Nonferrous Metal Basic Shapes	2,779
5	Grain Mill Products	2,682
6	Agricultural Chemicals	2,489
7	Paper	2,002
8	Petroleum Products	1,616
9	Industrial Chemicals	1,536
10	Paper or Building Board	916
11	Portland Cement	720
12	Miscellaneous Chemical Products	523
13	Plastic Matter or Synthetic Fibers	513
14	Converted Paper Products	498
15	Containers or Boxes (Paper)	434

Source: Reebie Associates, Maricopa Association of Governments

TABLE 37

LEADING NORTHBOUND RAIL COMMODITIES FROM MEXICO TO THE MAG REGION (IMPORTS)
(Individual Commodities By 3-Digit STCC)

	Commodity	Inbound Tons
1	Portland Cement	136,876
2	Motor Vehicles or Equipment	49,580
3	Agricultural Products	13,589
4	Nonferrous Primary Smelter Products	8,276
5	Nonferrous Metal Basic Shapes	4,006
6	Miscellaneous Food Preparations	2,972
7	Field Crops	2,707
8	Industrial Chemicals	2,168
9	Grain Mill Products	1,230
10	Construction Machinery or Equipment	887
11	Beverages or Flavor Extracts	378
12	Miscellaneous Fabricated Metal Products	302
13	Meat or Poultry (Fresh or Chilled)	95
14	Industrial Electrical Equipment	80
15	Communication Equipment	57

Source: Reebie Associates, Maricopa Association of Governments

Chapter Footnotes

1. U.S. Department of Transportation, Federal Highway Administration, *U.S. Freight: Economy in Motion 1998*, Page 17-18, May 1998.

2. U.S. Department of Transportation, Federal Highway Administration, *U.S. Freight: Economy in Motion 1998*, Pages 14-17, May 1998.

3. American Association of Railroads, *Railroads: The Vital Link to North America's Economic Future – Overview of U.S. Freight Railroads*, Pages 1-8, January 2003.

4. American Association of Railroads, Policy & Economics Department, *North American Freight Railroad Statistics*, Pages 1-2, May 14, 2003.

CHAPTER SEVEN

AIR CARGO

The purpose of this chapter is to provide a brief overview of the air cargo industry within the MAG Region. According to statistics provided by the U.S. Department of Transportation, Federal Highway Administration, in 1998 approximately 6.6 percent of all freight at the national level was transported by air. At a regional level, as of 2001 approximately 0.3 percent of all inbound and outbound freight movements within the MAG Region were conducted by air. The following information within this chapter will provide an overview of air cargo, regional air cargo facilities, free trade zones, air cargo transport in the MAG Region, and also provide information on the types of commodities that are transported as part of this particular freight mode.

OVERVIEW OF AIR CARGO

The Air Cargo, or "air freight" industry in the United States maintains a very important role in the overall freight transportation industry, and generates billions of dollars on an annual basis. Although the overall share of goods that are transported in the U.S. by plane are relatively low in comparison to the truck and rail freight modes, the air cargo industry continues to serve a primary role in specific segments of the overall goods movement process. The industry serves a number of particular markets, which are primarily focused on time-sensitivity issues, accommodating high-value commodities, and goods that solely rely on air transport for a variety of reasons.

Any form of freight that is transported by plane is considered air cargo. In general, enplaned air cargo goods consist of traditional bulk cargo, air express packages or air express cargo, mail, and passenger packages and baggage articles. There are a number of different carriers that are involved in the movement of such goods and packages. Air carriers vary in accordance with the type of service offered. Due to the diverse nature of the air cargo industry, there are a variety of ways to assess or analyze individual air freight carriers and the transporting of goods.

According to the U.S. Department of Transportation, for identification purposes, air freight services are categorized into whether goods are time sensitive, or less time sensitive; whether they are sent by integrated or non-integrated providers; or by the major type of cargo carrier, which are identified as being one of the following: express carrier, scheduled, mail, and chartered air service providers. At a national level, in 1997 approximately 62 percent of all air freight moved within the airline industry was

transported by express carrier; 25 percent was transported by scheduled service; 12 percent was transported by contracted mail planes; and about 1 percent was transported by a chartered service.[1]

By definition, integrated carriers, or otherwise referred to as express carriers, are air cargo providers that control every aspect of transportation affiliated with the movement of goods from one location to another. Integrated carriers are concerned with specific origin to destination time-definite service, and maintain their own planes, facilities, trucks and equipment. Examples of integrated carriers include companies such as Federal Express, Airborne Express or United Parcel Service (UPS).

Scheduled service carriers, or non-integrated carriers, are primarily comprised of passenger airlines that also carry goods. Under this particular segment of the air cargo industry, passenger airlines focus on airport-to-airport service and utilize on-plane cargo space to deliver freight. This mode of transport may involve a variety of airline companies and intermediaries to ensure the shipment of a given package or cargo. In addition to the primary integrated and non-integrated carriers, mail carriers deal in the transport of packages and mail affiliated with the U.S. Postal Service. Also, certain airline companies that offer cargo space for a fee are referred to as charter service providers. This particular segment accounts for the lowest percentage of the airline industry in terms of volume or revenue.

The first occurrences of successful, transported commercial air freight can be traced back to the 1910s in the State of Ohio. However, the movement of goods by air did not become common in the United States until the late 1920s, and into the early 1930s. Federal involvement in the air cargo industry began in 1926, when congress passed the Air Commerce Act, which was designed to improve and maintain safety standards. In 1940, the Civil Aeronautics Board began the economic regulation of the airlines, which included policies and provisions that governed air freight services. These activities were transferred to the newly established U.S. Department of Transportation, Federal Aviation Administration during 1967. In 1977, congress passed the Airline Cargo Deregulation Act, which put an end to all federal economic regulatory controls. Today, the Federal Aviation Administration is still responsible for regulating the safety aspects of the air cargo industry, but all economic regulatory activities over air cargo were terminated in 1977.

At the national and international levels, air freight is hauled by a number of cargo and passenger airplanes. The types of planes utilized to transport goods vary in accordance with the volume of freight, the type of freight, the market, freight handling requirements, and the distance which is required for a particular product or cargo load. Also, each company or industry carrier arrangement that is in place to transport goods via air may continue to depend upon the type of existing fleet, as well as the preferences and requirements of individual airlines.

The methods utilized to transport cargo items on a plane are handled in several ways. The types of freight items that are typically transported on a plane may consist of loose

passenger baggage or packages, express mail or packages, and larger bulk goods and items requiring special handling procedures. Goods that are transported by plane are loaded as bulk cargo, or sent through the use of containers or pallets. Bulk cargo consists of loose items, such as personal goods, packages and smaller shipments that are not unitized, and are commonly loaded underneath the cabin of an airplane. Containers, or otherwise referred to as Unit Load Devices (ULD), are box-like objects in which a number of loose items or packages are stored, protected and handled as a single unit in transfer from one location to another. ULD's vary in their shape and size, and represent a very efficient method of consolidating loose cargo items. Many of these containers are specifically designed to be transferred by trailers at airports, and are capable of easily being transferred from one mode of transport to another. Also, many air cargo operations utilize pallets to transport goods. This method of transport is common when transporting larger shipments from origin to destination points.

Today, air cargo, or "air freight" is a multi-billion dollar industry that provides a viable link in certain segments of the freight transportation industry. Integrated, or express carrier services are expected to continue their overall increase in relation to non-integrated services, and will continue to maintain the bulk share of the air cargo industry for many years to come. Also, according to air cargo industry statistics, in 1999 Federal Express and the United Parcel Service both collected over a billion dollars in domestic freight revenues, and are expected to continue their dominance over the air cargo industry within the United States into the future. According to recent forecasts conducted by the U.S. Department of Transportation, Federal Aviation Administration, it is anticipated that domestic airlines will maintain an annual growth rate of over 5 percent for domestic air cargo freight until the year of 2011.

REGIONAL AIR CARGO FACILITIES

As discussed in Chapter Three of this document, there are a total of 12 airports located throughout the Greater Phoenix Metropolitan Area of MAG. Of these airports, Phoenix Sky Harbor International and Williams Gateway are the primary airports that maintain functional air cargo operations. Sky Harbor International and Williams Gateway are the largest airports in the MAG Region, and maintain active schedules for inbound and outbound air freight.

Phoenix Sky Harbor International Airport consists of approximately 3,130 acres of land and maintains 3 runways, the longest of which is 11,490 feet. Sky Harbor International Airport is classified as a commercial/cargo airport, and in 2001 had a total of 579,846 flight operations (takeoffs and landings). Also, there were a total of 237 aircraft based on the premises of the airport. At present, Sky Harbor International Airport maintains four active air cargo facilities on the west side of the airport, which provide non-integrated and integrated air cargo services. Cargo Buildings A, B and C contain a total of 197,760 square feet of space, and collectively have a total of 103 air cargo bays to facilitate planes and air cargo. Each of the bays consist of approximately 1,920 square feet, and maintain adjacent ramps for parking that can accommodate a Boeing

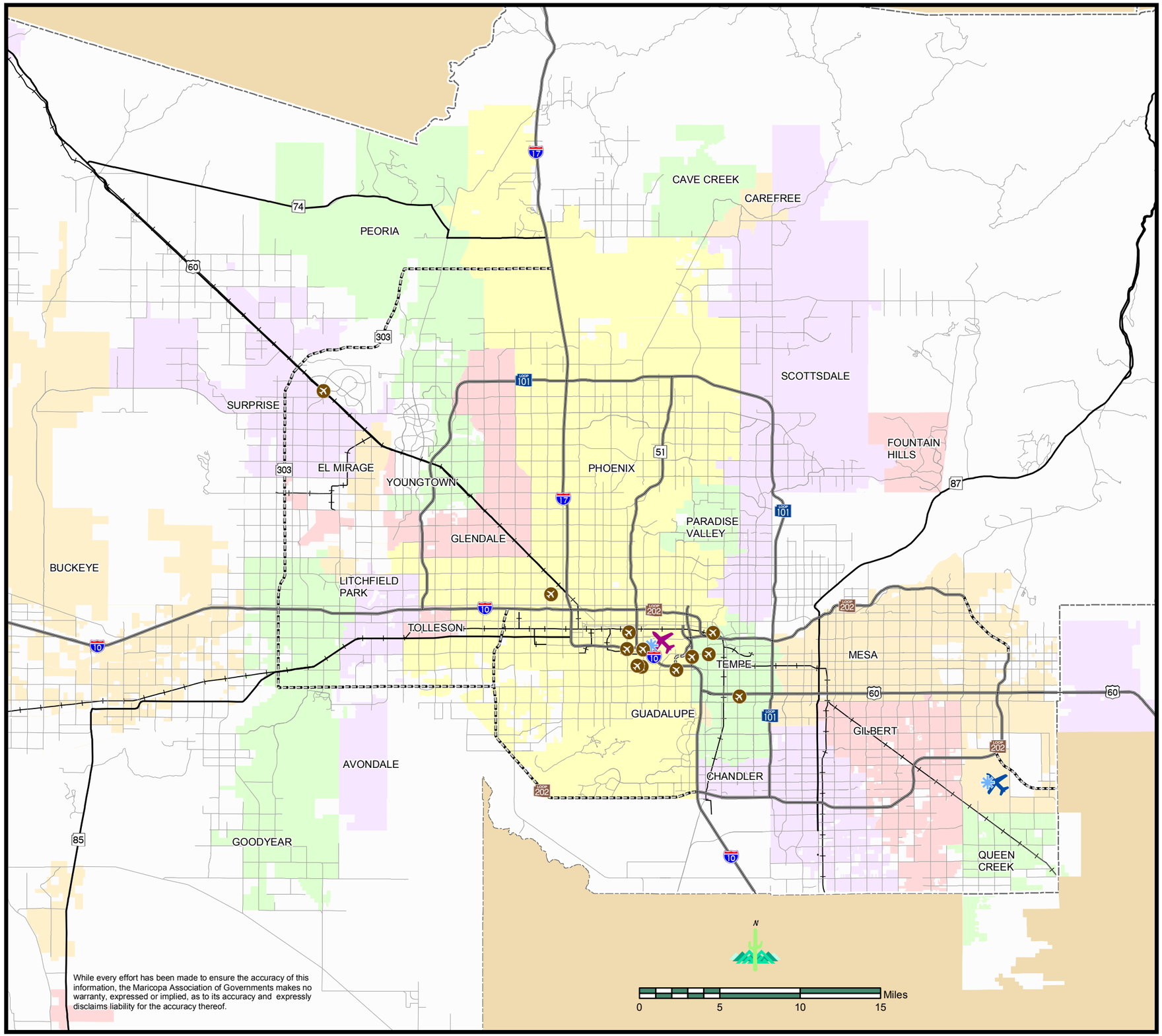
747 aircraft. Cargo Buildings A, B, and C are primarily focused on non-integrated services, and contain the following tenants: Airborne Express; American Airlines; Delta Airlines; Northwest Airlines; United Airlines; America West Airlines; British Airways; Lufthansa; Sun Devil; Aviation Services; Southwest Airlines, and the U.S. Postal Service, which contracts with freight forwarders and other passenger airlines to transport mail.

The South Air Cargo facility at Sky Harbor International is primarily focused on integrated services, and contains the following tenants: Federal Express (FedEx), United Parcel Service (UPS), and the U.S. Customs. The FedEx operations within the South Air Cargo Facility comprise a total of over 95,000 square feet, whereas the UPS facility consists of approximately 34,000 square feet. The U.S. Customs facility is somewhat smaller by comparison. FedEx and UPS currently function as the largest integrated service providers at the airport, and are responsible for transporting considerable amounts of incoming and outgoing freight. Unlike non-integrated service providers, which move goods throughout the course of the day, the integrated carriers primarily operate at night in an effort to alleviate potential interference with higher volumes of passenger air flights during the day.

Based upon reports and forecasts from Sky Harbor International Airport, the recent growth of industry in the MAG Region is expected to increase demand for air cargo services rather significantly. With the anticipation of increasing air cargo traffic at the airport, officials from Phoenix Sky Harbor International have recently organized an Air Cargo Task Force to plan for the expansion of facilities, and to address air cargo issues and concerns. This task force effort will primarily focus on the following air cargo elements: current operations and facilities; the needs of individual air cargo tenants; the current organizational structure of air cargo operations; and the development of plans for the future expansion of air cargo facilities. The findings will be incorporated into the Sky Harbor International Airport Master Plan, which is currently in progress.[2]

Williams Gateway airport, located in the City of Mesa, consists of approximately 3,303 acres of land, and maintains a total of three runways. The longest runway is estimated at 10,400 feet in length. As of 2001, the airport contained a total of 63 aircraft that were based on the grounds, and had a total of 158,489 flight operations (takeoffs and landings). At present, air cargo operations at Williams Gateway are comprised of specialized services, and are essentially comprised of unscheduled charter flights. Currently, there is not a specific building at the airport that is dedicated to the handling of inbound and outbound air cargo freight. Incoming and outgoing air cargo is transferred between planes and vehicles at the airport's middle apron area, and is temporarily stored within a variety of existing buildings and locations throughout the airport.

However, according to the *Williams Gateway Airport Master Plan*, there are specific plans to increase air cargo services to serve the growing demands of the East Valley of metropolitan Phoenix, and to alleviate cargo volume at the Phoenix Sky Harbor International Airport. Future dedicated air cargo facilities have been planned for east



While every effort has been made to ensure the accuracy of this information, the Maricopa Association of Governments makes no warranty, expressed or implied, as to its accuracy and expressly disclaims liability for the accuracy thereof.

MAG Regional Freight Assessment

Map 12

AIR CARGO FACILITIES

- Air Couriers
- Intermodal Facilities
- Sky Harbor Airport
- Williams Gateway Airport
- Existing Freeway/Expressway
- Planned Freeway/Expressway
- U.S. and State Highway
- Other Roads
- Railroad

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and west sides of the airport, and there is a planned expansion of one of the airport's runways to effectively accommodate air cargo aircraft. At present, Williams Gateway is actively working on the development of new cargo facilities, which includes an $11.0 Million cargo ramp that is currently under construction. They are also leasing land adjacent to the ramps for new cargo-related buildings.

It is anticipated that air cargo traffic will continue to increase within the MAG Region over the next 10 years. The majority of this traffic will flow through Phoenix Sky Harbor International Airport. However, Mesa Williams Gateway Airport will continue to play an increasing cargo handling role in the future, and will eventually become a primary regional air cargo facility. Both airports are currently in the process of addressing future levels of traffic, and identifying expansion and construction plans to serve the region's growing air cargo needs.

Map 12, entitled *Air Cargo Freight and Facilities*, identifies intermodal air facilities, the locations of each air cargo airport, and the air couriers that provide services to the region. By definition, an air courier is an establishment that is primarily engaged in furnishing air delivery of individually addressed letters, parcels, and packages (generally under 100 lbs.), except by the U.S. Postal Service. While these establishments provide their consignment through air service, the initial pick-up and final delivery of goods are made by truck. Although not displayed, some companies also have special arrangements with "freight forwarders," that are responsible for shipping and delivering larger packages and bulk cargoes.

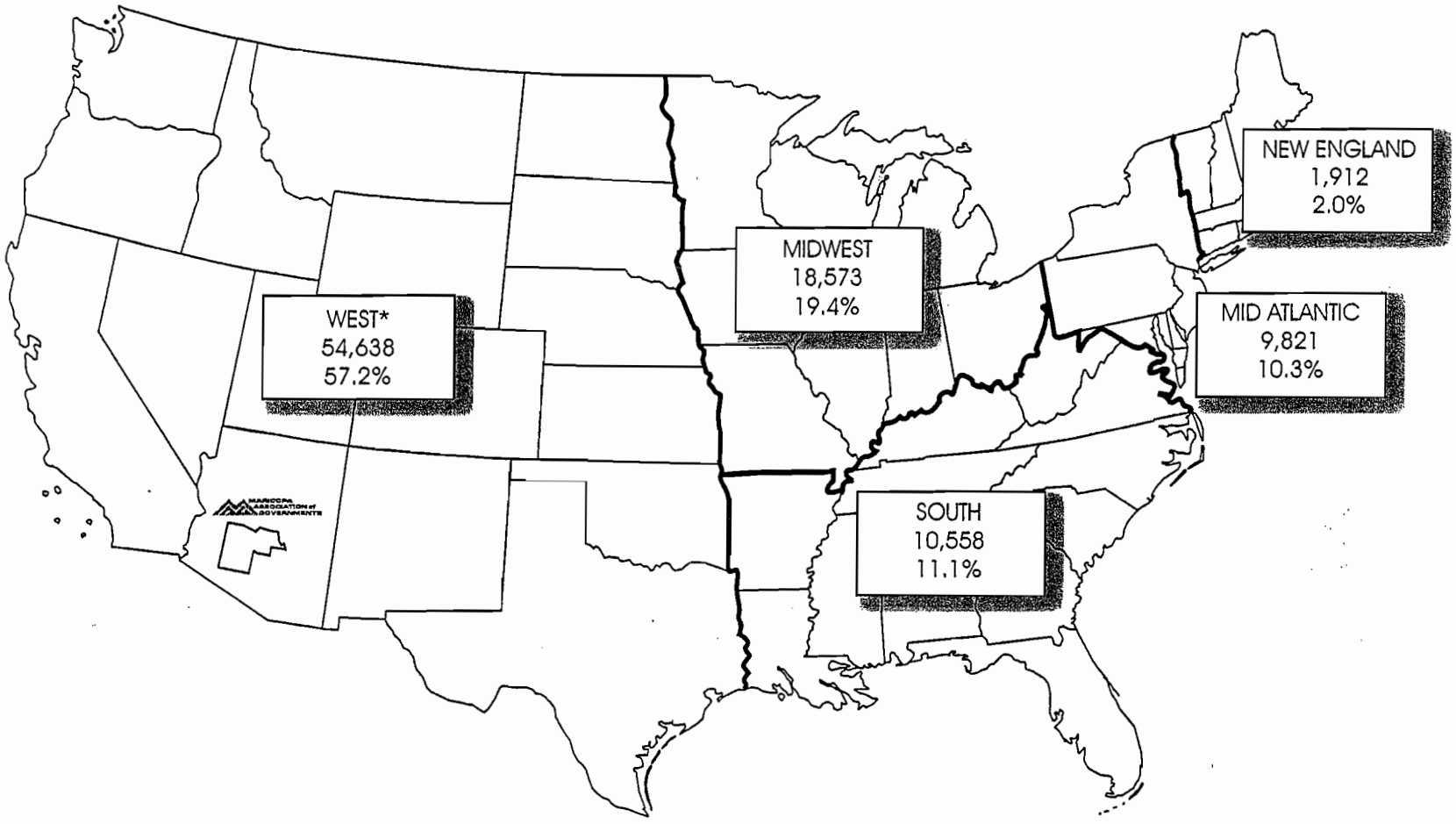
FREE TRADE ZONES

At present, Mesa Williams Gateway Airport and Phoenix Sky Harbor International Airport are both categorized as federal Free Trade Zones. By definition, a Free Trade Zone is identified as a port designated by the Government, which allows for the duty-free entry of any non-prohibited goods. A Free Trade Zone essentially treats incoming foreign merchandise as if it has not entered the U.S., which means that it can be remanufactured, combined with other goods, labeled, packaged or tooled, without duty having to be paid. Duties are imposed on the goods (or items manufactured from the goods) only when they pass from the foreign trade zone into other areas of the country, subject to the customs authority.

AIR CARGO TRANSPORT IN THE MAG REGION

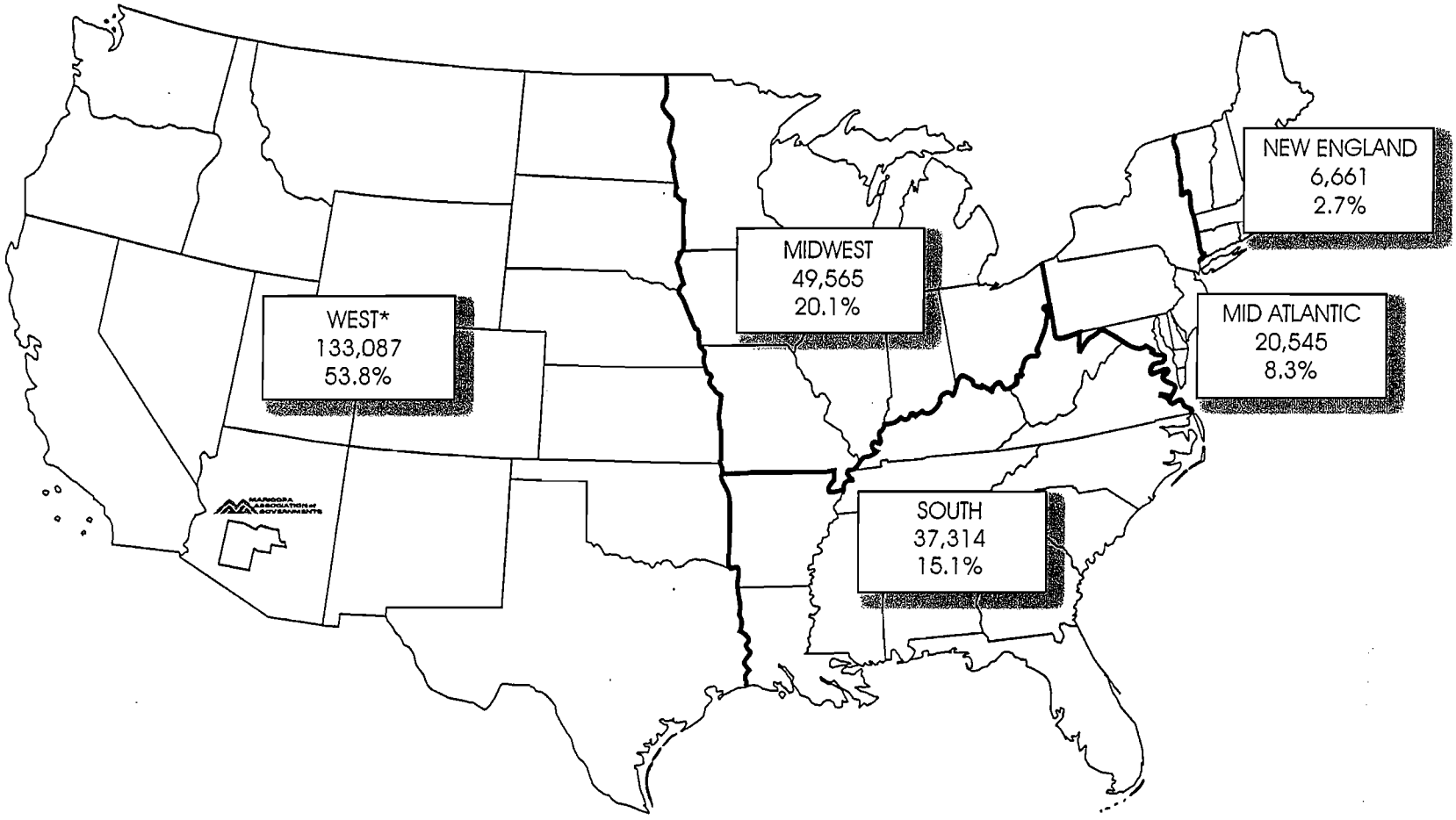
By definition, air cargo is considered any form of freight that is transported by plane. In 2001, there was a total of 342,674 tons of inbound and outbound rail freight moving in and out of the MAG Region. Of this amount, 72.1 percent (247,172 tons) was inbound, and 27.9 percent (95,502) was outbound from the region.

FIGURE 35
DESTINATIONS OF OUTGOING AIR FREIGHT FROM THE MAG REGION — NATIONAL
(By Total Tons-2001)



*INCLUDES AREAS WITHIN ARIZONA (OUTSIDE OF MARICOPA COUNTY), AND ALASKA AND HAWAII.

FIGURE 36
ORIGINS OF INCOMING AIR FREIGHT TO THE MAG REGION — NATIONAL
(By Total Tons-2001)



*INCLUDES AREAS WITHIN ARIZONA (OUTSIDE OF MARICOPA COUNTY), AND ALASKA AND HAWAII.

TABLE 38

OUTGOING AND INCOMING AIR FREIGHT IN THE MAG REGION
(National Totals for Destination and Origin of Air Freight by Region - 2001)

Outgoing Freight (Destination)			Incoming Freight (Origin)		
Region	**State**	**Total Tons**	**Region**	**State**	**Total Tons**
New England	Rhode Island	40	**New England**	Rhode Island	324
	New Hampshire	0		New Hampshire	258
	Connecticut	364		Connecticut	3,257
	Massachusetts	1,508		Massachusetts	2,822
	Maine	0		Maine	0
	Vermont	0		Vermont	0
		1,912			**6,661**
Midwest	Wisconsin	913	**Midwest**	Wisconsin	1,782
	Michigan	2,271		Michigan	2,258
	Ohio	2,546		Ohio	15,021
	Indiana	1,302		Indiana	13,450
	Illinois	4,214		Illinois	5,726
	Missouri	3,510		Missouri	6,497
	Minnesota	3,724		Minnesota	4,804
	Iowa	93		Iowa	29
		18,573			**49,565**
Mid-Atlantic	New Jersey	2,679	**Mid-Atlantic**	New Jersey	5,235
	Pennsylvania	2,947		Pennsylvania	10,187
	New York	2,377		New York	1,922
	Delaware	0		Delaware	0
	Washington DC	0		Washington DC	0
	Maryland	1,818		Maryland	3,201
		9,821			**20,545**
West	Arizona	1,279	**West**	Arizona	4,964
	California	16,392		California	65,860
	Nevada	5,582		Nevada	5,014
	New Mexico	3,190		New Mexico	4,062
	Utah	2,317		Utah	4,198
	Texas	12,149		Texas	25,218
	Colorado	3,021		Colorado	3,796
	Kansas	444		Kansas	866
	Oklahoma	946		Oklahoma	1,740
	Oregon	2,793		Oregon	4,932
	Washington	4,263		Washington	6,183
	Idaho	748		Idaho	1,126
	Wyoming	0		Wyoming	0
	Montana	0		Montana	0
	Nebraska	1,087		Nebraska	4,875
	South Dakota	0		South Dakota	0
	North Dakota	0		North Dakota	0
	Alaska	83		Alaska	196
	Hawaii	45		Hawaii	57
		54,638			**133,087**

(Continued)

OUTGOING AND INCOMING FREIGHT IN THE MAG REGION

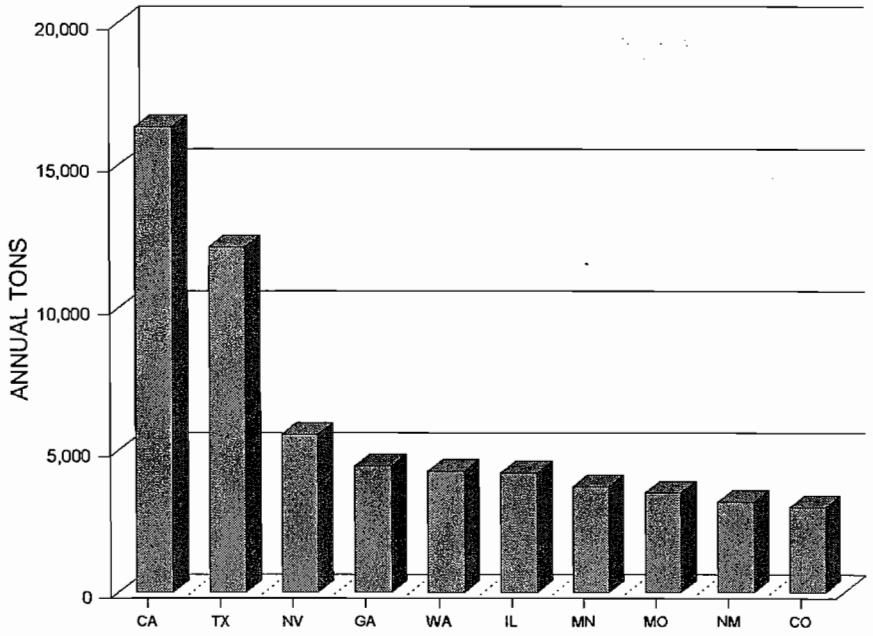
(National Totals for Destination and Origin of Freight by Region)

Outgoing Freight (Destination)			Incoming Freight (Origin)		
Region	**State**	**Total Tons**	**Region**	**State**	**Total Tons**
South	Georgia	4,450	**South**	Georgia	6,650
	Florida	2,243		Florida	2,757
	Tennessee	478		Tennessee	7,969
	Alabama	131		Alabama	495
	North Carolina	824		North Carolina	1,711
	Virginia	871		Virginia	907
	West Virginia	0		West Virginia	0
	Kentucky	733		Kentucky	15,249
	South Carolina	2		South Carolina	0
	Louisiana	540		Louisiana	733
	Mississippi	92		Mississippi	281
	Arkansas	195		Arkansas	561
		10,558			**37,314**
TOTAL OUTGOING		**95,502**	**TOTAL INCOMING**		**247,172**

Source: Reebie Associates, Maricopa Association of Governments - * Rounding factors may cause slight variations in figures

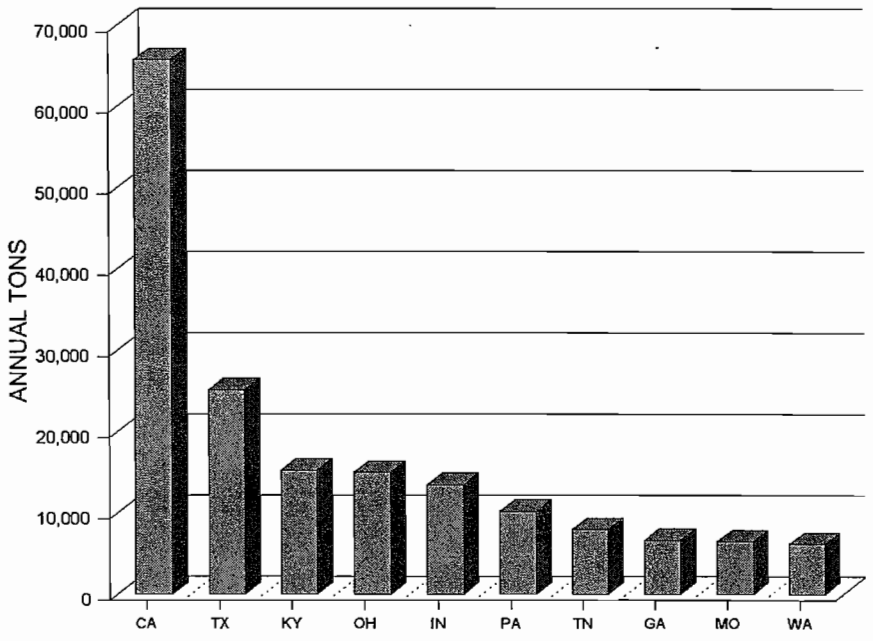
Figures 35 and 36 provide information on the origins and destinations of all air freight in the MAG Region. As displayed on Figure 35, approximately 57.2 percent of all outgoing air freight was sent to areas throughout the West; 19.4 percent was sent to the Midwest; 11.1 percent was sent to the South; 10.3 percent was sent to the Mid-Atlantic states; and the remaining 2.0 percent of all air freight was sent to the New England states. Figure 36 displays the origins of all inbound air freight into the MAG Region from other regions of the country. In 2001, approximately 53.8 percent of all inbound freight originated from the West; 20.1 percent originated from the Midwest; 15.1 percent originated from the South; 8.3 percent originated from the Mid-Atlantic; and the remaining 2.7 percent originated from the New England states.

FIGURE 37
OUTBOUND AIR FREIGHT FROM THE MAG REGION: TOP 10 DESTINATION STATES



Source: Reebie Associates, Maricopa Association of Governments

FIGURE 38
INBOUND AIR FREIGHT TO THE MAG REGION: TOP 10 ORIGIN STATES



Source: Reebie Associates, Maricopa Association of Governments

Table 39 identifies the total amount of air freight that was outgoing from, and incoming to the MAG Region in 2001. Figures 37 and 38 display the top 10 states of origin and destination outside of Arizona. The primary states (in order) for outbound air freight in 2001 were California, Texas, Nevada, Georgia and Washington. The primary states of origin (in order) for inbound air freight were California, Texas, Kentucky, Ohio and Indiana. Outside of Arizona, the primary trading partners for all inbound and outbound air movements are the states of California and Texas. Also, Table 39 provides an overview of the primary metropolitan areas of trade in the United States for all outbound and inbound air freight in 2001.

TABLE 39

AIR CARGO FREIGHT
PRIMARY METROPOLITAN AREAS OF TRADE
(Outbound and Inbound Goods - 2001)

Outbound Freight (Destination)			Inbound Freight (Origin)		
	Metropolitan Region	Total Tons		Metropolitan Region	Total Tons
1	Los Angeles, California	7,677	1	San Francisco/Oakland, California	30,920
2	San Francisco/Oakland, California	5,572	2	Los Angeles, California	30,894
3	New York, New York	5,323	3	Louisville, Kentucky	13,935
4	Las Vegas, Nevada	4,563	4	Indianapolis, Indiana	13,450
5	Atlanta, Georgia	4,450	5	Dayton, Ohio	11,547
6	Chicago, Illinois	4,214	6	New York, New York	9,718
7	Minneapolis, Minnesota	3,734	7	El Paso, Texas	8,848
8	Seattle, Washington	3,707	8	Philadelphia, Pennsylvania	8,293
9	Dallas/Ft. Worth, Texas	3,591	9	Austin, Texas	7,862
10	Houston, Texas	3,429	10	Atlanta, Georgia	6,649

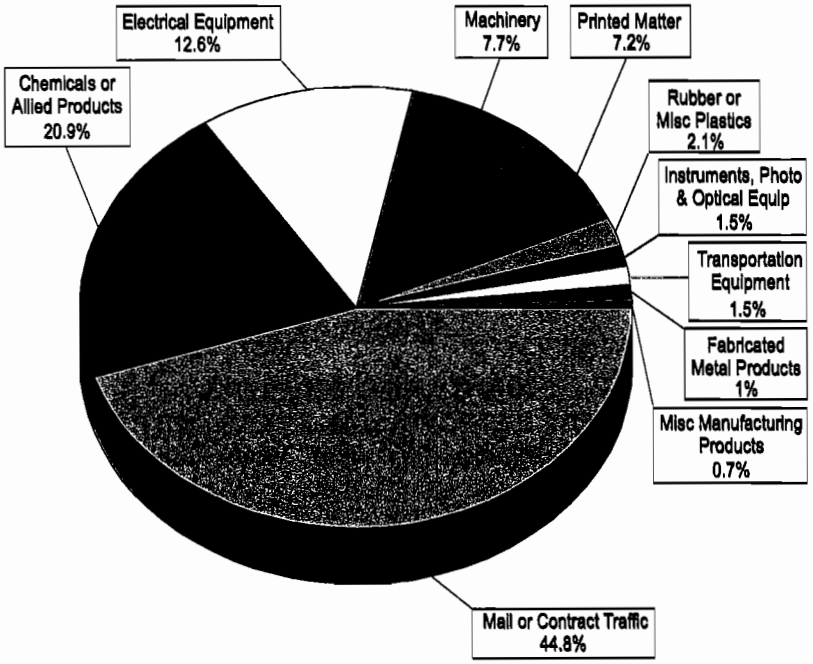
Source: Reebie Associates; Maricopa Association of Governments

COMMODITY ANALYSIS

The purpose of this section is to provide an overview of the types of commodities that are transported by air cargo. As similar to the information provided in the trucking and rail chapters of this document, the data contained and displayed within this section is based on the Reebie Standard Transportation Commodity Classification (STCC) system.

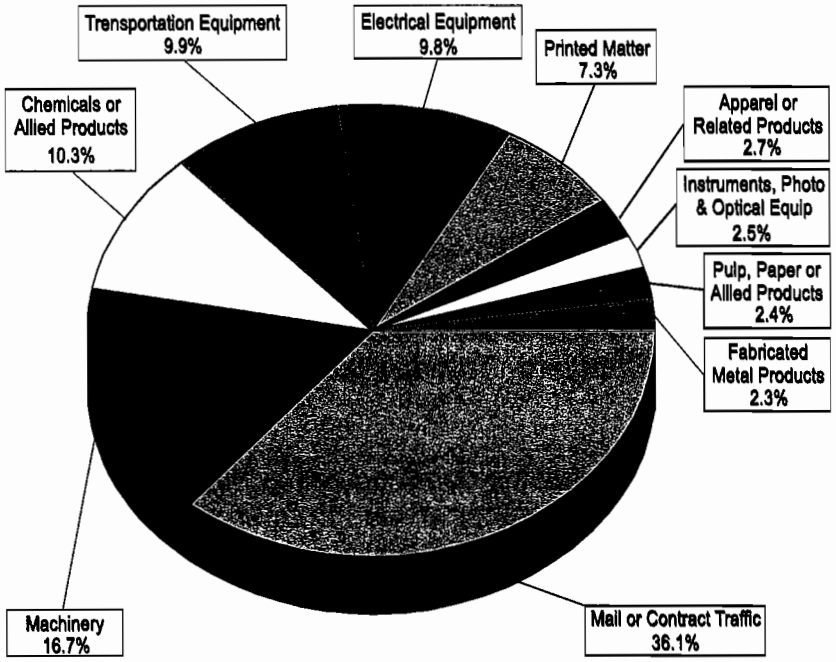
Figure 39 displays the top 10 leading commodities at the 2-digit STCC level, which were shipped from the MAG Region to other areas throughout Arizona and the United States during 2001. The primary commodities that were shipped out of the region included mail or contract traffic; chemicals or allied products; electrical equipment; machinery; and printed matter. In 2001, about 42,000 tons of mail or contract traffic items were shipped out of the region by air. Also, over 5,000 tons of chemicals, electrical equipment and machinery were exported out of the region.

FIGURE 39
TOP OUTBOUND AIR FREIGHT COMMODITIES FROM THE MAG REGION



Source: Reebie Associates, Maricopa Association of Governments

FIGURE 40
TOP INBOUND AIR FREIGHT COMMODITIES TO THE MAG REGION



Source: Reebie Associates, Maricopa Association of Governments

TABLE 40

LEADING OUTBOUND AIR CARGO COMMODITIES FROM THE MAG REGION
(Individual Commodities By 4-Digit STCC)

	Commodity	Outbound Tons
1	Mail and Express Traffic	42,180
2	Miscellaneous Printed Matter	6,829
3	Electronic Data Processing Equipment	6,623
4	Miscellaneous Industrial Organic Chemicals	5,198
5	Miscellaneous Electronic Components	4,774
6	Miscellaneous Industrial Inorganic Chemicals	4,134
7	Plastic Matter or Synthetic Fibers	2,311
8	Potassium or Sodium Compound	2,224
9	Chemical Preparations	1,996
10	Rubber or Plastic Footwear	1,977
11	Storage Batteries or Plates	1,732
12	Radio or Television Transmitting Equipment	1,431
13	Motor Vehicle Parts or Accessories	1,149
14	Telephone or Telegraph Equipment	1,096
15	Solid State Semiconductors	1,089

LEADING INBOUND AIR CARGO COMMODITIES TO THE MAG REGION
(Individual Commodities By 4-Digit STCC)

	Commodity	Inbound Tons
1	Mail and Express Traffic	74,693
2	Electronic Data Processing Equipment	20,286
3	Motor Vehicle Parts or Accessories	11,503
4	Miscellaneous Printed Matter	7,752
5	Storage Batteries or Plates	6,504
6	Missile or Space Vehicle Parts	5,335
7	Chemical Preparations	4,226
8	Miscellaneous Industrial Organic Chemicals	4,365
9	Miscellaneous Plastic Products	4,089
10	Women's or Children's Clothing	3,075
11	Pharmaceuticals	2,786
12	Deciduous Fruits	2,702
13	Newspapers	2,580
14	Solid State Semiconductors	2,579
15	Fresh Fish or Whale Products	2,177

Source: Reebie Associates, Maricopa Association of Governments

Figure 40 displays the top 10 leading commodities at the 2-digit STCC level that were transported by air into the MAG Region during 2001. The primary inbound commodities that were received include mail or contract traffic; machinery; chemicals or allied products; and transportation and electrical equipment. In 2001, approximately 74,000 tons of mail or contract traffic items were transported into the MAG Region from other regions of the United States. In addition to Figures 39 and 40, Table 36 displays the top 15 outbound and inbound air commodities at the 4-digit STCC level.

Table 41 provides information on the leading inbound and outbound commodities by total value. This table ranks rank the top commodities that are transported between the MAG Region and other areas of the country by air in 2001. The total tons are calculated into pounds, which are then multiplied against a standard value per pound unit of transport in accordance with the standardized Reebie TRANSEARCH database, to reach a total value figure expressed in U.S. Dollars.

TABLE 41

TOTAL VALUE OF OUTBOUND AIR CARGO COMMODITIES FROM THE MAG REGION
(2001)

	COMMODITY	OUTBOUND TONS	TOTAL POUNDS	VALUE PER POUND (U.S. Dollars)	TOTAL VALUE (U.S. Dollars)
1	Electronic Data Processing Equipment	6,623	13,246,000	20.400	270,218,400
2	Semiconductors	1,089	2,178,000	71.647	156,047,166
3	Miscellaneous Electronic Components	4,774	9,548,000	15.053	143,726,044
4	Radio/TV Transmitting Equipment	1,431	2,862,000	34.894	99,866,628
5	Mail and Express Traffic	42,180	85,620,000	0.998	85,448,760
6	Miscellaneous Printed Matter	6,829	13,658,000	4.287	58,551,846
7	Telephone or Telegraph Equipment	1,096	2,192,000	16.029	35,135,568
8	Rubber or Plastic Footwear	1,977	3,954,000	4.126	16,314,204
9	Pharmaceuticals	763	1,526,000	7.246	11,057,396
10	Industrial Organic Chemicals	5,198	10,396,000	0.496	5,156,416

TOTAL VALUE OF INBOUND AIR CARGO COMMODITIES TO THE MAG REGION
(2001)

	COMMODITY	INBOUND TONS	TOTAL POUNDS	VALUE PER POUND (U.S. Dollars)	TOTAL VALUE (U.S. Dollars)
1	Missile or Space Vehicle Parts	5,335	10,670,000	109.525	1,168,631,750
2	Electronic Data Processing Equipment	20,286	40,572,000	20.400	827,668,800
3	Semiconductors	2,580	5,160,000	71.647	369,698,520
4	Mail and Express Traffic	74,693	149,386,000	0.998	149,087,228
5	Miscellaneous Printed Matter	7,752	15,504,000	4.287	66,465,648
6	Women and Girl's Clothing	3,075	6,150,000	8.854	54,452,100
7	Pharmaceuticals	2,786	5,572,000	7.246	40,374,712
8	Miscellaneous General Industrial	1,992	3,984,000	5.871	23,390,064
9	Miscellaneous Plastic Products	4,089	8,178,000	1.730	14,147,940
10	Storage Batteries or Plates	6,504	13,008,000	0.950	12,357,600

Source: Reebie Associates, Maricopa Association of Governments

As displayed on Table 41, the leading outbound commodities were electronic data processing equipment; semiconductors; rniscellaneous electronic components; radio and television transmitting equipment, and mail and traffic express. Shipments of electronic data processing equipment were valued at a total of $270 Million dollars,

which represents the highest valued cargo exported from the MAG Region by air. As displayed on Table 41, the leading inbound commodities were missile or space vehicle parts; electronic data processing equipment; semiconductors; mail and traffic expense; and miscellaneous printed matter. Missile or space vehicle parts were valued at $1.2 Billion dollars, which represent the highest valued import into the MAG Region by air during 2001.

Chapter Footnotes

1. U.S. Department of Transportation, Federal Highway Administration, *U.S. Freight: Economy in Motion 1998*, Page 49, May 1998.

2. Phoenix Sky Harbor International Airport, http://phoenix.gov/AVIATION/cargo

CHAPTER EIGHT

SUMMARY

The MAG Regional Freight Assessment provides a general overview of freight, considers the locations of freight sites and activities, assesses commodity flows and the types of commodities in transport, and also provides a more specific overview of the trucking, rail and air cargo freight modes. The purpose of this study is to provide for an assessment of the goods movement process within the MAG Region, and to establish an initial framework that leads to the enhancement of regional freight planning.

When considering the continued growth of the region, there will be a need at both the local and regional levels to improve, and in some cases, expand upon, or develop new freight infrastructure to accommodate goods movement. This may involve a wide range of activities, from freight-related studies to the improvement, expansion or development of warehouse facilities, connectors, intermodal facilities, Intelligent Transportation Systems (ITS) and logistics, and the transportation network over which freight is transported.

Many freight projects and planning activities often have direct transportation and economic development impacts that reach beyond existing municipal boundaries. A comprehensive freight plan, policy guidelines, and an overall strategy for freight planning could serve as an advantage in accommodating future levels of growth in goods movement. A multi-jurisdictional planning effort for freight throughout the region could assist in the coordination of freight infrastructure developments, land use-transportation compatibility, regional mobility and capacity issues, industry logistic factors, potential ingress and egress issues, and in the long-term economic efficiency for industry transport facilities and activities.

An expanded knowledge of the freight industry, as well as a better understanding of various patterns and intensity of freight flows; the connectivity and inter-relationships of various intermodal facilities; public and private sector issues; and infrastructure needs, would allow the primary decision makers of the region to better assess the regional network and to identify solutions that could potentially ease congestion and increase the efficiency of goods movement.

While this study provides the initial base for a general understanding of goods movement throughout the region, the next possible step is to establish a comprehensive freight plan. Such a plan would result in policies to help guide local and regional public

investments in necessary freight infrastructure, and would also provide for an in-depth needs assessment. In building upon the *MAG Regional Freight Assessment*, a comprehensive freight plan for the MAG Region would accomplish the following items:

- Clearly define the role of MAG in the context of freight planning. In particular, defining the ways in which the freight industry can benefit through MAG's actions.
- The identification of critical issues which are pertinent to the regional freight industry, and an overview of regional strengths and weaknesses for the freight industry by mode.
- Establish a comprehensive assessment and listing of crucial freight planning and infrastructure needs throughout the region.
- To establish relevant policies, guidelines, and goals and objectives that are specific to the freight industry of the MAG Region.
- Establish performance measures to ensure the monitoring and successful implementation of the plan.
- Establish a regional freight strategy to ensure the successful implementation of the plan.
- Involve freight industry stakeholders in the freight planning process to ensure that MAG's freight planning activities improve goods movement within the region.
- Provide for an annual update and identification of project needs, and identify potential funding sources.
- Provide for a ranking of project needs by level of priority for use in the MAG Transportation Improvement Program (TIP).

However, prior to initiating a formal planning process, it would be necessary to establish a regional freight stakeholder's workgroup that can provide input into the comprehensive planning process. Throughout the development of the plan, this workgroup would be responsible for chapter reviews; providing needed technical and professional input; assisting with critical issue identification by mode; assisting with liaison activities; assisting in the development of a comprehensive needs assessment; assisting in the identification and development of reasonable performance measures for regional freight planning; assisting in the identification of recommended guidelines and policies for ongoing planning and implementation; and assisting in the development and implementation of a process designed to ensure comprehensive, and continued Freight Planning within the MAG Region. Once completed, in an effort to maintain a proactive

approach to regional freight planning, it would be essential to continue an ongoing review and update of the document on a regular basis.

In summary, the *MAG Regional Freight Assessment* was developed in an effort to serve as the initial phase in a subsequent freight planning process for the MAG Region, by providing a partial inventory and analysis for further review. This process could effectively be carried out by creating a freight advisory workgroup; developing a comprehensive freight plan; identifying local and regional projects of significance, and to recommending infrastructure and freight planning projects for future funding.

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